
Vashon-Maury Island

2009 Water Resources Data Report

Part of the Water Resources Evaluation Project

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King County

Department of Natural Resources and Parks
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Table of Contents

Executive Summary	vii
1.0. Introduction.....	1
1.1 Overview.....	1
1.2 2009 Monitoring Activities.....	2
1.3 Objective.....	3
2.0. Precipitation	4
2.1 Precipitation sites	4
3.0. Surface Water Monitoring	5
3.1 Stream gauging sites	5
3.1.1 Island-wide gauging.....	5
3.2 Stream water quality sites	5
4.0. Groundwater Monitoring	7
4.1 Water Level Monitoring	7
4.1.1 Volunteer sites	7
4.1.2 Long-Term sites	8
4.1.3 Monitoring wells.....	8
4.2 Water Quality Monitoring.....	8
5.0. Exempt Well Metering.....	10
6.0. Summary	12
7.0. References.....	13

Figures

Figure 1. Locations of all gauging (precipitation, continuous stream, and crest/staff) activities on Vashon-Maury Island.	14
Figure 2. Accumulated daily totals of precipitation for all sites on Vashon-Maury Island.	15
Figure 3. Hydrograph of daily stream flows (mean, maximum and minimum) for the Judd Creek site, gauge 28A.	16
Figure 4. Hydrograph of daily stream flows (mean, maximum and minimum) for the Shingle Mill Creek site, gauge 43A.	17
Figure 5. Hydrograph of daily stream flows (mean, maximum and minimum) for the Tahlequah Creek site, gauge 65A.	18
Figure 6. Hydrograph of daily stream flows (mean, maximum and minimum) for the Fisher Creek site, gauge 65B.	19
Figure 7. Hydrograph of daily stream flows (mean, maximum and minimum) for the Green Valley Creek site, gauge 65C.	20
Figure 8. Typical hydrograph for the Island-wide stream gauge sites showing a decrease in stream flow from late winter/spring through early fall.	21
Figure 9. Nitrate + Nitrite water quality data from Vashon-Maury Island Creeks since November 2006 to September 2009.	22
Figure 10. Temperature data from Vashon-Maury Island Creeks from November 2006 to September 2009.	23
Figure 11. Fecal Coliform data from VMI Streams from November 2006 to September 2009.	24
Figure 12. E. Coli data from VMI Streams from November 2006 to September 2009.	25
Figure 13. Groundwater monitoring sites on Vashon-Maury Island.	26
Figure 14. Depth to water (DTW) measurements in feet below land surface at the seven volunteer sites on VMI during the Water Year 2009.	27
Figure 15. Depth to water (DTW) measurements in feet below land surface for the volunteer monitoring sites since 2001.	28
Figure 16. Water table elevations for site VAS_w-60, North Vashon, based on continuous levelogger water level data and manual depth to water measurements.	29

Figure 17. Water table elevations for site VAS_w-61, Valley Center Park-n-Ride 2” well, based on continuous levellogger water level data and manual depth to water measurements.....	30
Figure 18. Water table elevations for site VAS_w-63, Redding Beach Rd, based on continuous levellogger water level data and manual depth to water measurements.	31
Figure 19. Water table elevations for site VAS_w-64, Wax Orchard Rd @ Vashon Hwy, based on continuous levellogger water level data and manual depth to water measurements.....	32
Figure 20. Water table elevations for site VAS_w-65, Valley Center Park-n-Ride 6” well based on continuous levellogger water level data and manual depth to water measurements.....	33
Figure 21. Water table elevations for site VAS_w-70, Valley Center Park-n-Ride Deep well based on continuous levellogger water level data and manual depth to water measurements.....	34
Figure 22. Water table elevations for site VAS_w-71, Island Center Forest well based on continuous levellogger water level data and manual depth to water measurements.	35
Figure 23. Depth to water (DTW) measurements for the monitoring wells on VMI since October 2005 to present.	36
Figure 24. Exempt well metering locations.	37
Figure 25. Average daily usage of permit exempt wells on VMI since April 2007 through water year 2009 from eight volunteer locations.	38

Tables

Table 1. Precipitation Gauge Sites on Vashon-Maury Island with difference in rainfall totals for water year 2009 to 2008.	39
Table 2. Monthly rainfall totals in inches for Water Year: 2009 and 2008	40
Table 3. Comparison of precipitation totals by Water Year (Oct-Sep) for all precipitation gauge sites on Vashon-Maury Island.	41
Table 4. An annual summary of flow data based on the water year for all continuous stream gauge sites on Vashon-Maury Island.	41
Table 5. Comparison of Stream Flow by Water Year (Oct-Sep) for all continuous stream gauge sites on Vashon-Maury Island.	42
Table 6. Instantaneous flow measurements at stream gauge sites measured semi-annually as part of the Island-wide assessment of stream flow.	43
Table 7. List of parameters sampled as part of the surface water water quality monitoring started in November 2006.	44
Table 8. Depth to water data for volunteer water level sites during WY2009.	44
Table 9. The relative change of the annual average (in feet) from the baseline of the depth to water measurements done during Water Years 2004 to 2009 for the five long-term water level sites.	45
Table 10. Water level measurements for long-term water quality sites on Vashon-Maury Island for 2009.	46
Table 11. Water level measurements at the dedicated groundwater monitoring wells on VMI during the WY2009.	47
Table 12. Environmental Indicators – Arsenic, Chloride, and Nitrate+Nitrite – sampling results at the long-term monitoring sites.	48
Table 13. Water quality sampling results for long-term monitoring sites within the Quartermaster Harbor Nitrogen Management Study Area.	48
Table 14. Water Quality sampling results for the monitoring well sites.	49
Table 15. Average Daily usage of permit exempt wells shown as gallons per day.	50

Appendices

Appendix APrecipitation Data A-1

Appendix BWater Quality Data

 B-1Stream Water Quality Data..... B-1-1

 B-2Long-Term Monitoring Sites Water Quality Data..... B-2-1

 B-3Monitoring Well Water Quality Data B-3-1

EXECUTIVE SUMMARY

King County Water and Land Resource Division (WLRD) has been monitoring precipitation, stream flow and groundwater on Vashon-Maury Island (VMI) for a number of years in an effort to better understand the island water balance and overall water quality. Starting in 2009 through 2012, the WRE activities are being coordinated with the Quartermaster Harbor Nitrogen Management Study. This study is evaluating the role of nitrogen in the risk of low oxygen events in Quartermaster Harbor, to recommend policy changes in the 2012 King County Comprehensive Plan update for nitrogen management on Vashon-Maury Island, and to assess management options for implementing the recommended policy changes. This report summarizes the monitoring activities completed during the water year 2009 for the Water Resource Evaluation (WRE) Project.

A variation of 5 inches of precipitation was observed across the island and four out of the five sites recorded more rainfall than Sea-Tac airport, the area reference. Site 65U, Tahlequah, recorded the most rainfall at 40.1 inches. The East Maury Island site, 36V, recorded the least amount of rainfall with 19.1 inches due to equipment failure. No data was collected at this site from April through September. The SeaTac annual total precipitation for the 2009 water year was 34.0 inches which is below the annual average of 37.2 inches (based on historic data 1971-2000). The difference in total precipitation between water year 2008 and 2009 varied across the island from a 4.8 inch decrease at Site 43U, North Vashon to a 3.8 inch increase at Site 65U, South Vashon — Tahlequah.

Stream gauging activities in 2009 recorded decreases in stream flow at four out of the five sites when comparing water year 2009 to water year 2008. This change coincides with the precipitation patterns.

The water quality assessment of VMI creeks continued in 2009 at Shingle Mill, Fisher, Judd, Mileta, and Gorsuch creeks. The parameters of interest are temperature, dissolved oxygen, pH, specific conductance, nutrients, and indicator bacteria. This list of parameters is comparable to other stream sampling done in King County. These sites have good water quality when compared to other King County streams locations. Mileta Creek has concentrations of nitrate+nitrite over 4 mg/L during the winter months that were higher than other VMI creeks which have average concentrations over 1 mg/L. The bacteria (fecal coliform and *E. coli*) data for water year 2009 show two large spikes (up to 5000 cfu/100ml) do not seen in previous water years. This water quality work has continued to help assess if these observations are random or consistent events.

In 2009, groundwater water level monitoring activities continued across the island at our volunteer sites and our monitoring wells. Two volunteer sites that had been added into this network in 2006 are no longer participating in the program. The data collected by volunteers since 2001 was assessed for water level trends in selected areas on VMI. A baseline has been established by averaging all measurements taken at each of these five sites during water years 2002 and 2003. Increases in the depth to water measurements refer to a lower water table as compared to baseline while decreases refer to a higher water table. The data from four of the

five sites show increases in depth to water measurements for water year 2009. The data from the other site is showing a decrease.

Continuous recording water level devices were installed in the dedicated monitoring wells in 2006 and 2009. These data sets show fluctuations in the water table not seen in the monthly volunteer measurements. The extent and duration of these fluctuations vary by well location and are likely related to recharge events. Equipment challenges during the year means some sites have data gaps for selected periods of time. Manual water level measurements were recorded at these locations during the year to help calibrate the continuous water level measurements.

The groundwater water quality sampling, completed in September, included the environmental indicators of arsenic, chloride, and nitrate+nitrite at the long-term monitoring locations. These sites have been monitored by King County WLRD since 2001. Overall, the water quality of the groundwater on VMI is very good as compared to drinking water standards. The concentrations of these parameters were similar to the results in the previous 11 rounds of sampling. Additional parameters (nutrients, alkalinity and silica) were included at long-term sites within the Quartermaster Harbor Nitrogen Management project study area. King County WLRD monitoring wells were also sampled this year as in 2007. The list of water quality parameters for these sites is similar to the stream sites with the exception of bacteria and the addition of metals. One of these monitoring wells had an average arsenic concentration at 11.3 µg/L which is above the drinking water standard of 10 µg/L.

Permit exempt well usage data is being reported as part of the WRE data report. This work began in April 2007 and has continued to the present. Currently, this project has eight volunteers reporting their results on a regular basis. The results to date show a wide range of usage from ~30 to over 900 gallons per day per household. The average daily per capita usage of these households range from 39 to 153 gallons for water year 2009.

The precipitation, stream and groundwater monitoring activities of the WRE project will continue in 2010. The data collected will be presented in a similar report and on the King County web pages.

1.0. INTRODUCTION

The Water Resource Evaluation (WRE) project is intended to cover monitoring, modeling, and data management activities within Vashon-Maury Island (VMI) for seven years (2004-2010). As part of this work, monitoring activities and results are summarized in annual reports. The structure of the report is as follows: Section 1.0 – Introduction and Overview; Section 2.0 – Precipitation; Section 3.0 – Surface Water Monitoring; Section 4.0 – Groundwater Monitoring; Section 5.0 – Exempt Wells and Section 6.0 – Summary.

1.1 Overview

Vashon-Maury Island in Central Puget Sound has a land area of about 36 square miles. All drinking water sources on the island (springs, surface water, and groundwater) are supplied by precipitation. Groundwater is the portion of precipitation that soaks into the ground and is stored in underground geological water systems called aquifers. Every groundwater system is unique and dependent upon factors such as the rate of precipitation, the interaction of groundwater with the streams and other surface water bodies, and the rate of evapotranspiration. These factors all contribute to the overall water budget. Understanding the water balance for VMI and changes that occur in response to human activities and climate changes is important in determining the amount of drinking water that can be used on a sustained basis.

A long-term plan to monitor and evaluate the different components of the VMI water balance is being implemented by the WRE project to address needs and concerns identified by residents of VMI and the staff of King County Water and Land Resources Division (WLRD). Much interest has been expressed over the years in the sustainability of the water supply on the island, although prior to the WRE there has not been a comprehensive study to address the many major water supply issues.

Starting in 2009 through 2012, the WRE activities are being coordinated with the Quartermaster Harbor Nitrogen Management Study¹ and data will be utilized for both projects². This study will evaluate the role of nitrogen in the risk of low-level oxygen events in Quartermaster Harbor, to recommend policy changes in the 2012 King County Comprehensive Plan update for nitrogen management on Vashon-Maury Island, and to assess management options for implementing the recommended policy changes.

¹ Quartermaster Harbor Nitrogen Management Study web page can be found at:
<http://www.kingcounty.gov/qmhnitrogenstudy>.

² The Quality Assurance Project Plan for the Quartermaster Harbor Nitrogen Management Study can be found at:
<http://your.kingcounty.gov/dnrp/library/2009/kcr2073.pdf>.

The work plan of the Water Resources Evaluation Project is designed to provide a scientific evaluation of the water supply issues (both water quantity and quality related) on VMI³. The work plan for the VMI Water Resources Evaluation has four main objectives:

1. To monitor Vashon-Maury Island groundwater and surface water quantity and quality to record and identify changes over time;
2. To build a comprehensive groundwater flow model that evaluates groundwater and surface water quantity and quality under various climate change and land-use scenarios;
3. To satisfy the goals of the countywide data management work plan for the Vashon-Maury Island region; and
4. To coordinate activities with the Vashon-Maury Island Groundwater Protection and Land Use Committees, and the citizens of Vashon Maury Island.

To satisfy the objectives of this project, the work is being done in four major areas. The first three areas, monitoring, modeling, and data management are closely interrelated and must be responsive to each other to satisfy the first three objectives of this work plan. The last area, project communication, addresses the fourth and final objective.

1.2 2009 Monitoring Activities

Groundwater, surface water, and precipitation are being monitored in an effort to better describe the VMI water budget and overall water quality. Monitoring efforts on VMI will serve three purposes (1) to identify changes and trends in groundwater and surface water quantity and quality, (2) to provide necessary data for model development and calibration, and (3) to have an early warning system on the impacts of pollution sources and groundwater extraction. This monitoring is conducted by a combination of King County WLRD staff and volunteers. Data collected in previous years have been presented in several different formats. The precipitation and stream-flow gauging data have been available via request and web site:

<http://green.kingcounty.gov/WLR/Waterres/hydrology/GaugeListSearch.aspx>. The groundwater data collected in previous years was presented in a report summarizing all of King County's groundwater monitoring, and is available from the following website:

<http://www.kingcounty.gov/environment/waterandland/groundwater/maps-reports.aspx>. The following headers give brief descriptions of the data and outline the major monitoring tasks.

Precipitation

Precipitation monitoring has continued on VMI in 2009. KC WLRD staff maintained continuous precipitation gauges at selected gauge locations (see section 2.1).

Stream-flow gauging

Stream gauging continued on the creeks of VMI in 2009. The existing KC WLRD continuous stream-gauge network on VMI consists of 5 sites: Shingle Mill Creek, Green Valley Creek,

³ The work plan can be found at: <http://your.kingcounty.gov/dnrp/library/archive-documents/wlr/wq/vashon-island/pdf/Vashon-Maury-Island-plan.pdf>.

Tahlequah Creek, Fisher Creek, and Judd Creek. Additional streams sites are monitored on a semi-annual basis (see section 3.1).

Stream water quality collection

Five streams (Shingle Mill, Fisher, Judd, Mileta, and Gorsuch Creeks) were sampled for a selected set of water quality parameters. This work continued as part of Quartermaster Harbor Nitrogen Management Study during 2009. This study is assessing the water quality of surface water entering Quartermaster Harbor as well as island reference sites. Additional information and locations are provided in section 3.2.

Water-level measurements

Water level measurements continue to be taken by volunteers at regular intervals. Additional water level data is being collected at 10 dedicated groundwater-monitoring wells throughout VMI. These wells were equipped with data loggers that monitor water level fluctuations on a continuous basis (see section 4.1.3). Water-level measurements are downloaded from the data loggers during the year by KC WLRD staff. The volunteers send their data to King County via e-mail.

Groundwater quality sample collection

This task involves collecting groundwater samples from our long-term well locations. These sites are currently 18 public supply/private wells that have been sampled since 2001 (see section 4.2). The current water quality program has a set of environmental indicators, arsenic; chloride; and nitrate+nitrite, that are sampled annually at all sites.

Permit Exempt Well Usage Monitoring

This task involves receiving data from volunteers who are monitoring the usage of their permit exempt well. This work is ongoing and started in April 2007. Currently the WRE project has eight volunteers who are reporting the usage data to KC WLRD staff via e-mail. This data collection effort is starting to fill a data gap of exempt well usage (see Section 5.0).

1.3 Objective

This report summarizes the data collection activities during the water year: October 2008 to September 2009. A variety of activities are done as part of the WRE project. The WRE annual reports, started in 2006, are to provide all the data and an assessment in one report.⁴

⁴ Annual data reports for the WRE project can be found at the document web page:
<http://www.kingcounty.gov/environment/waterandland/groundwater/management-areas/vashon-maury-island-gwma/vashon-island/project-documents.aspx>.

2.0. PRECIPITATION

This type of gauging activity on VMI was expanded in 2005 as part of the project. This increased effort is needed to help establish a baseline of conditions as well as highlight the variety of conditions across the island.

2.1 Precipitation sites

Five sites are currently being monitored for precipitation across VMI. The locations of the gauging sites are shown in Figure 1 and listed in Table 1. The data from Sea-Tac airport is also included in Table 1 as an area reference. The data presented in Table 1 is summarized as total precipitation (inches per year). The annual totals are calculated for the water year (WY) – October 1st 2008 to September 30th 2009⁵. Accumulated daily totals of precipitation for all VMI sites are presented in Figure 2.

Site 65U, Tahlequah, has the most rain for the WY at 40.1 in/yr (Table 1, Figure 2 and Appendix A). The other VMI sites that had a complete record were Site 43U, North Vashon, with 39.0 in, Site 28Y, Judd Creek, with 37.0 in and Site 36U – Maury Island with 35.1. The East Maury Island site, Site 36V, had an incomplete record for the 2009 WY. Typically this location has the least amount of rainfall of all of the VMI sites. This was true for 2009 but incomplete rainfall totals do not allow a direct comparison (Table 1, Figure 2 and Appendix A).

In WY 2009, the distribution of rainfall was different when comparing precipitation totals from the previous water year (Table 1). The South Vashon site, 65U, had more rainfall when compared to the previous year while the rest of the sites had slight decreases. An incomplete records (data gaps) of the Maury Island sites, 36U and 36V, does not allow direct comparison of the annual totals, yet monthly data can be compared between water years for those months with a complete record (Table 2). Table 3 provides a comparison of precipitation totals by water year for all VMI gauge sites as well as Sea-Tac —the area reference site.

The site, 36V – East Maury Island, is the driest portion of the island. Table 2 highlights the difference on the total precipitation by month for each site. The Sea-Tac data is less than all the Vashon-Maury Island sites except for 36V – East Maury Island highlighting the need to have numerous local sites to record the local variation.

⁵ The water year is a standard way to report this type of data so as not to separate the wetter winter season between two calendar years. A water year can be any 12 month period, usually selected to begin and end with a relatively dry season. The period from October 1 to September 30 is typically used in the United States and the standard for the Pacific Northwest.

3.0. SURFACE WATER MONITORING

Surface water monitoring is an important component of the WRE. The WRE is continuing its stream gauging and water quality monitoring across the island to better understand surface – groundwater interactions.

3.1 Stream gauging sites

Five creeks on VMI, Shingle Mill Creek, Green Valley Creek, Tahlequah Creek, Fisher Creek and Judd Creek, are monitored as part of the existing KC WLRD stream-gauge network. All gauging locations are shown in Figure 1 and the continuous gauging sites are listed in Table 4.

Judd Creek, site 43a, is the largest stream basin on VMI and has the largest mean stream flow, Q_{mean} , for all sites (Table 4). Hydrographs of mean, maximum, and minimum daily flows for each site are presented in Figures 3 through 7.

A comparison of the mean stream flow data for previous water years was done for all sites. Four out of the five stream sites showed a decrease in WY 2009 when compared to WY 2008 except for site 65a, Tahlequah (Table 5). This difference is also seen in the precipitation totals for the island with all areas having decreases except for South Vashon (65U – Tahlequah).

3.1.1 Island-wide gauging

In 2004, King County began measuring instantaneous stream flow a couple of times during the year on VMI to better assess the amount of flow in stream catchments where continuous gauging is not feasible. These measurements continued at 28 locations during the water year on two occasions — October and June. The locations are shown in Figure 1 and the data are presented in Table 6. Data from these sites are consistent with typical annual stream hydrographs – higher stream flow in late winter with lower flow until mid to late Fall. Figure 8 is a typical hydrograph of these sites based on data collected at Christensen Creek.

3.2 Stream water quality sites

In late 2006, water quality sampling started at seven stream locations across Vashon-Maury Island, see Figure 1. Until this effort, very little data had been collected to assess the quality of the streams on the island with the exception of source water locations (Beall and Ellis Creeks). The parameters are temperature, dissolved oxygen, pH, specific conductance, nutrients and indicator bacteria (see Table 7). This list of parameters is comparable to other stream sampling done in King County. In 2009, the water quality work continued at five sites, Shingle Mill, Fisher, Judd, Mileta, and Gorsuch Creeks. The sampling at Christian and Tahlequah Creeks ended in December 2007.

Concentration versus time graphs of VMI creeks for nitrate+nitrite and temperature are presented in Figure 9 and Figure 10, respectively. Bacteria (fecal coliform and *E. coli*) data are presented in Figure 11 and Figure 12. All VMI water quality data are presented in Appendix B. The water

quality of VMI creeks were compared to state water quality standards along with other King County stream sites.⁶ The bacteria (fecal coliform and *E. coli*) data for water year 2009 show two large spikes (up to 5000 cfu/100ml) do not seen in previous water years(Figures 11-12). At this time, the exact source causing this is unknown. The potential sources are warm blooded mammals including but not limited to birds, deer, horses and/or people.

Mileta Creek is one site that has varying concentrations of nitrate+nitrite throughout the year that are higher than other VMI creeks and King County stream sites, particularly during the winter, Figure 9 . The cause of these elevated levels of nitrate during the winter months is not currently known.

⁶ The comparison to state water quality standards are doen and presented as part of the King County Stream and River Water Quality Monitoring web page —
<http://green.kingcounty.gov/WLR/Waterres/StreamsData/StreamList.aspx>

4.0. GROUNDWATER MONITORING

A major part of this project focuses on the groundwater on VMI. This project is expanding the water level and water quality monitoring across the island to better understand local variations.

4.1 Water Level Monitoring

In 2009, the WRE project continued the water level monitoring by supporting the volunteers who monitor their own well water levels and installing continuous recording devices in our dedicated monitoring wells.

4.1.1 Volunteer sites

The volunteer sites started with five individuals that have monitored water levels in their own wells since 2001. Two new sites started in 2006. The measurements are typically taken once a month and reported to KC staff via e-mail. These locations are shown in Figure 13. The data are presented in Table 8 and shown in Figure 14. Two of the sites, GWL_w-01 and GWL_w-06, have very small fluctuations in the measurements during the year with changes in the range of tenths of a foot (Figure 14 and Table 8). The other five sites show a typical annual hydrograph with smaller depth to water (DTW) measurements in late spring and greater depth to water measurements in late summer/early fall (Figure 14 and Table 8).

The volunteer sites have been monitoring their wells monthly since 2001 and this allows for assessment of trends for selected areas on Vashon-Maury Island. A baseline has been established by averaging all of measurements taken for WYs 2002 and 2003. The number of water level measurements taken varies from 11 to 21 for this 24 month period. Establishing a baseline allows for a simple comparison of measurements to this average. Some limitations are present using this technique, such as the limited number of measurements used to establish the baseline number for a few sites. Another concern is the seasonal variation may not be accurately captured, depending on when the baseline measurements were taken.

Table 9 shows the relative change of the annual average from the baseline in the DTW measurements taken during WYs 2004 through 2009 for five long-term water level monitoring sites. Two of these sites, GWL_w-06 and GWL_w-09, show a trend of increasing DTW with time from WY 2004 to 2008. Data from site GWL_w-01 shows a decreased in the DTW measurements when compared to the baseline during the same time period. Site GWL_w-13 has had a similar trend as GWL_w-01 except WY2009 showed increasing DTW data. The last site shows a varying difference from year to year. Another way to visualize the data is to show the monthly DTW measurements versus time (Figure 15). This figure has three separate graphs of the volunteer sites with increasing depth to water on the left and the same annual time periods across the top. The purpose of this figure is to highlight the seasonal variation recorded at some sites.

Two of the recent volunteers, who started in 2006, decided to discontinue their participation in the volunteer water level data collection program. Their sites are still available for data gathering for island-wide water level surveys.

4.1.2 Long-Term sites

Water level data was collected at nine of the 18 long-term sites that are sampled for water quality. These water level measurements were collected in late September during the annual water quality sampling event (Table 10). These locations are identified with a unique symbol in Figure 13.

4.1.3 Monitoring wells

King County WLRD has 10 monitoring wells on VMI. Six monitoring wells were drilled and installed in the fall of 2005, October-December. Four additional monitoring wells were drilled and installed during October 2007 through January 2008. Water level measurements are taken at the time of data download of the logger devices. Continuous water level loggers were installed in these locations in 2006 and 2009. The locations of these monitoring wells are shown in Figure 13 and the DTW data are presented in Table 11 and Figure 23. The continuous data from each site are shown in Figures 16 through 22 with the exception of VAS_w-62 – “dry”; VAS_w-72 – data problems; and VAS_w-73 – well head issues.⁷

The continuous water level recorders that were installed in each well had a variety of problems this water year. The likely cause of this problem is related to the direct read cables installed in 2008. The cables were purchased at fixed intervals and as such needed to be adjusted in the field. The recorder was either set at the wrong depth or the cable slipped. Examples of this can be seen in the water level time series plots of VAS_w-60 – Vashon Highway at 145th Pl and VAS_w-64 – Wax Orchard Rd at Vashon Hwy, Figure 16 and Figure 19, respectively. Site VAS_w-65 – Valley Center Park-n-Ride had equipment failure where the device did not record any readings between sessions (Figure 20). Site VAS_w-72 – Paradise Ridge Park had equipment issues where the device was not below the water table due to a cable issue. No data is presented for this site. Additional field time (quarterly assessments) are scheduled this year to help resolve and minimize data loss due to equipment problems.

4.2 Water Quality Monitoring

The water quality sampling, done in September 2009, included the environmental indicators of arsenic, chloride, and nitrate+nitrite at 16 of the 19 long-term monitoring locations, see Figure 13. These sites have been monitored by King County WLRD since 2001 (King County, 2005a, 2006a, 2007, 2008). The results of this monitoring are presented in Table 12 and Appendix B. Overall, the water quality of the groundwater on VMI is very good when compared to drinking water standards⁸. The concentrations of these indicators were similar to the results in the previous 11 rounds of sampling (Table 12). The nitrate+nitrite data show a slight increase for three sites while three other sites show a decrease in values. The remaining groundwater

⁷ The term “dry” refers to no water was measured in the screen zone for this location. The probe at w-72 site was above the water table. Site w-73 currently does not permit a logger installation due to well cap issues.

⁸ Drinking water standards are set by U.S. Environmental Protection Agency and enforced by Washington State for public water systems. The list of standards can be found at: <http://www.epa.gov/safewater/contaminants/index.html>.

sampling sites have had little to no variation in their detected values. All sampling results are presented in Appendix B

Starting in 2009, long-term water quality sites within the Quartermaster Harbor Nitrogen Management project study area are being sampled for additional parameters - alkalinity, ammonia As N, total nitrogen, phosphorus, total, phosphorus, ortho, silica and total suspended solids. The results for these additional parameters are presented in Table 13.

King County WLRD monitoring wells were also sampled in September 2009 after the long-term sampling event. Six of the nine monitoring wells were sampled⁹. The other three wells were not sampled due to excessive sediment in the screen zone. This fine sediment caused high turbidity issues that did not resolve. Additional development for these wells will occur at a later date.

The water quality of the previously sampled wells, VAS_w-61 and VAS_w-65, is very good and similar to the 2007 results (King County, 2008). The list of parameters included the environmental indicators, as noted above, are presented in Table 14. Well VAS_w-70 does have arsenic concentrations over the Maximum Contaminant Level (MCL)¹⁰ of 10 µg/L with average results of 11.4 µg/L. This concentration is in the range of values found in other 'deep' wells (VAS_w-04 and VAS_w-07) on VMI. All water quality results are presented in Appendix B.

⁹ Total number of monitoring wells is 10 but one well is dry.

¹⁰ Drinking water standards are set by U.S. Environmental Protection Agency and enforced by Washington State Department of Health for public water systems. The list of standards can be found at:
<http://www.epa.gov/safewater/contaminants/index.html>.

5.0. EXEMPT WELL METERING

The WRE project is designed to provide data on many aspects of the water resources on VMI. One area that does not have sufficient data is water used by exempt wells. Exempt wells are wells that are “permit exempt” for water rights. Washington State law (RWC 90.44.050) grants these wells the ability to withdraw up to 5,000 gallons a day for domestic usage. See Washington State Department of Ecology for additional permit exceptions — http://www.ecy.wa.gov/programs/wr/comp_enforce/gwpe.html.

To better understand the overall water balance of the island, it’s important to know who is using the resource and how much water are they using. On VMI, there are four subsets of water users — Group A (large) Public Water System (PWS), Group B PWS (small), Irrigation/Industrial, and Permit Exempt. Typically, the source is metered to know how much water is being used and/or to show compliance with a water right. The permit exempt wells are not required to meter their usage.

In 2007, the WRE project solicited volunteers to monitor their usage of their “permit exempt” well. King County provided the equipment (water meter) and the cost of installation by a professional in exchange for providing data on a regular basis. To date, eight sites have had meters installed on their wells (Figure 24). The data collection started in April 2007 and is presented through 2009 WY.

The data presented is an average of daily usage for each household. The number of persons per household varied from one to a family of five. Additional factors that also effect usage is the outside usage of water. Many of the volunteers report using water for landscaping, gardens and/or for animals. The value calculated is the difference of the meter readings divided by the number days between readings to yield an average usage per day. At least three of the volunteers report the meter readings on a regular monthly schedule, while several others report on a quarterly basis. The remaining readings occur randomly providing an overall assessment of annual usage verses monthly or seasonal patterns.

The data to date has yielded a range of usage patterns for a small subset of this type of users. One volunteer consistently uses a low volume of water daily of about 30 gallons a day compared to a summertime usage of >900 gallons a day for another (Figure 25 and Table 15). Typically the readings are about 110 gallons per day per well. The monthly readings from a few of the volunteers do show increases in usage during June through October. Not all of the volunteers show this pattern of increased water demand in the summer months (Figure 25 and Table 15).

The average daily per capita usage of these households range from 39 to 153 gallons for water year 2009. The modeling work done as part of the WRE project uses a daily average of 266 gallons per day per well and with an average household (per the 2000 US Census) of 2.4 persons per household yields a per capita usage of 110 gallons a day (King County, 2005b). This value of 110 gallons per day is similar to some of the larger (Group A) Public Water Systems usage data on VMI. These water providers have a range of average daily usage of 100 to 200 gallons per day per connection. Data from several of these systems show increased usage during May through October with 60 to 75% of the total annual use during this period.

The Vashon-Maury Island Groundwater Protection Committee has noted on several occasions during their quarterly meeting updates that the current meter volunteers are a very small subset of exempt wells. The current monitoring is <1% of the total number of permit exempt wells, which is over 800 and growing. Additional volunteers are welcome to participate in the study. The data collection and reporting will continue in 2010.

6.0. SUMMARY

The WRE project conducted a wide variety of monitoring activities during the water year 2009. This report summarizes the data based on the type of activity – precipitation; stream flow gauging; stream water quality; groundwater water level measurements; groundwater water quality sampling; and permit exempt well usage.

The data collected during the water year 2009 showed it was much drier than the previous water year. This drier water year was also reflected in the stream flow measurements. The mean daily flows were less in water year 2009 when compared to the 2008 for the continuous stream gauging sites except South Vashon (65U – Tahlequah) which had a slight increase. The water level data for the water year shows a mixed pattern of increases and decreases in the depth to water data.

Stream water quality data continued to show sporadic increases in indicator bacteria from month to month. In particular, data from Fisher and Judd creeks have increased values during the summer months. Nitrate+nitrite data for one creek (Mileta) is still showing much higher concentrations during winter, which is distinct from the other creeks on VMI.

The water quality data from the long term sites is similar to previous years. Groundwater nitrate+nitrite data show a slight increase for three sites while three other sites show a decrease in values. The remaining groundwater sampling sites have had little to no variation in their detected values. Six of the nine King County WLRD monitoring wells were sampled in September 2009. The water quality of previously sampled monitoring wells, VAS_w-61 and VAS_w-65, is very good and similar to the 2007 results (King County, 2008). The list of parameters included the environmental indicators, as noted above, are presented in Table 14. Well VAS_w-70 does have arsenic concentrations over the MCL of 10 µg/L with average results of 11.4 µg/L. This concentration is in the range of values found in other ‘deep’ wells (VAS_w-04 and VAS_w-07) on VMI.

The usage data to date from our volunteer exempt well sites has yielded a range of usage patterns for a small subset of this type of users. One volunteer consistently uses a low volume of water daily of about 30 gallons a day compared to a summertime usage up to 900 gallons a day for another. The average daily per capita usage of these households range from 39 to 153 gallons for water year 2009. The monthly readings from a few of the volunteers do show increases in usage during June through October. Data from several of the larger (Group A) Public Water Systems show increased usage during May through October with 60 to 75% of the total annual use during this period. Not all of the volunteers show this pattern of increased water demand in the summer months some of usage data on VMI.

The precipitation, stream and groundwater monitoring activities on VMI will continue in 2011. The data collected will be presented in a similar report and posted on the King County web pages.

7.0. REFERENCES

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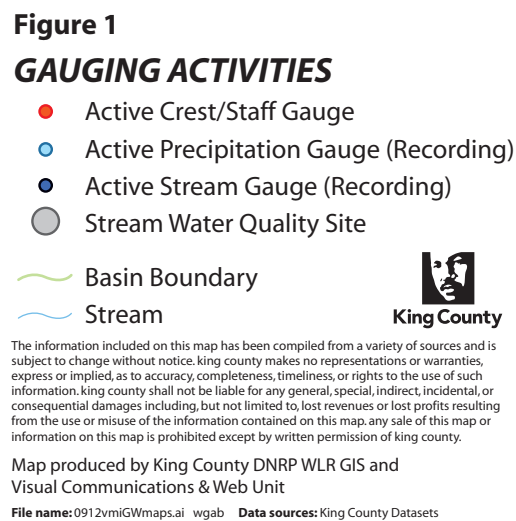
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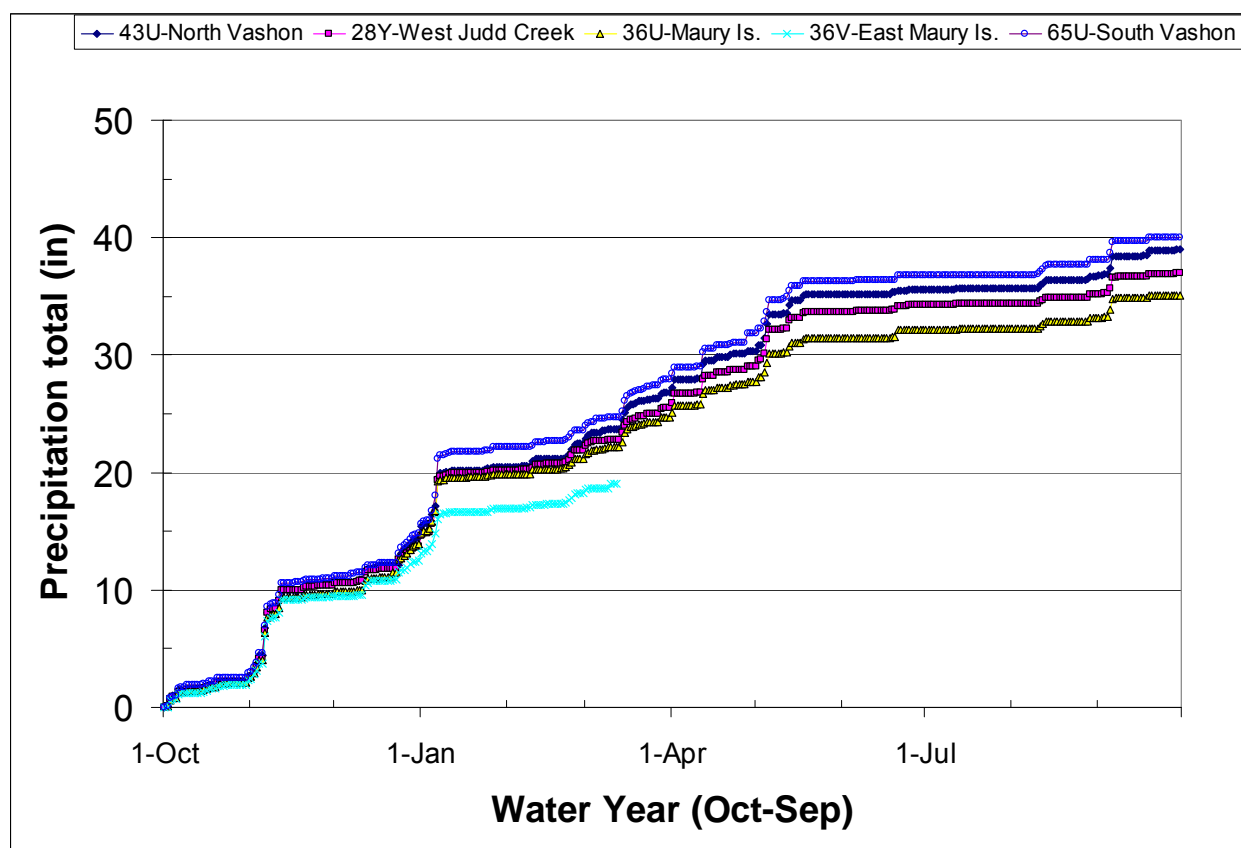


Figure 2. Accumulated daily totals of precipitation for all sites on Vashon-Maury Island. The figure displays the data on a Water Year (October to September) time.

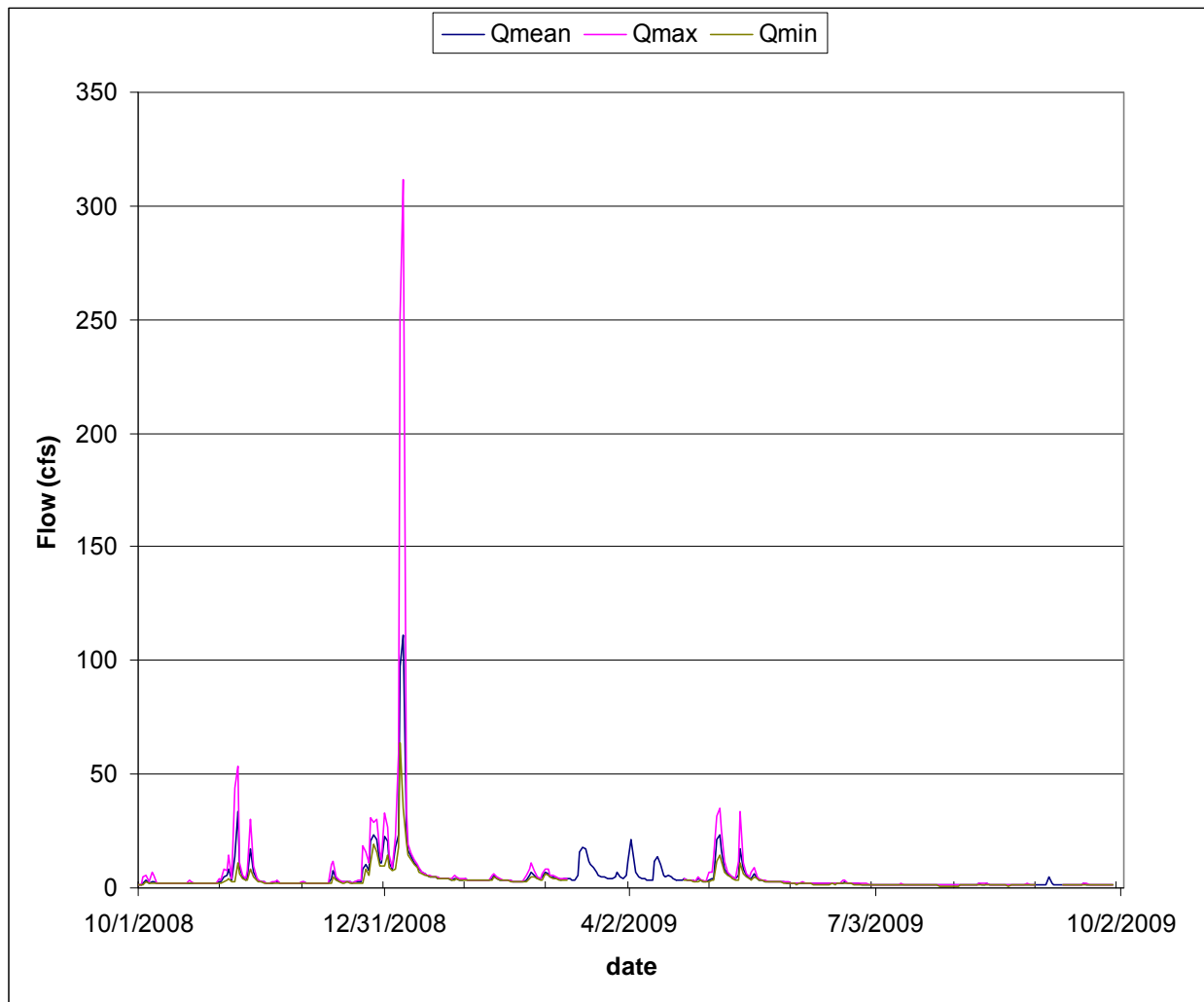


Figure 3. Hydrograph of daily stream flows (mean, maximum and minimum) for the Judd Creek site, gauge 28A. The time period shown is from October 1, 2008 to September 30, 2009 — Water Year 2009.

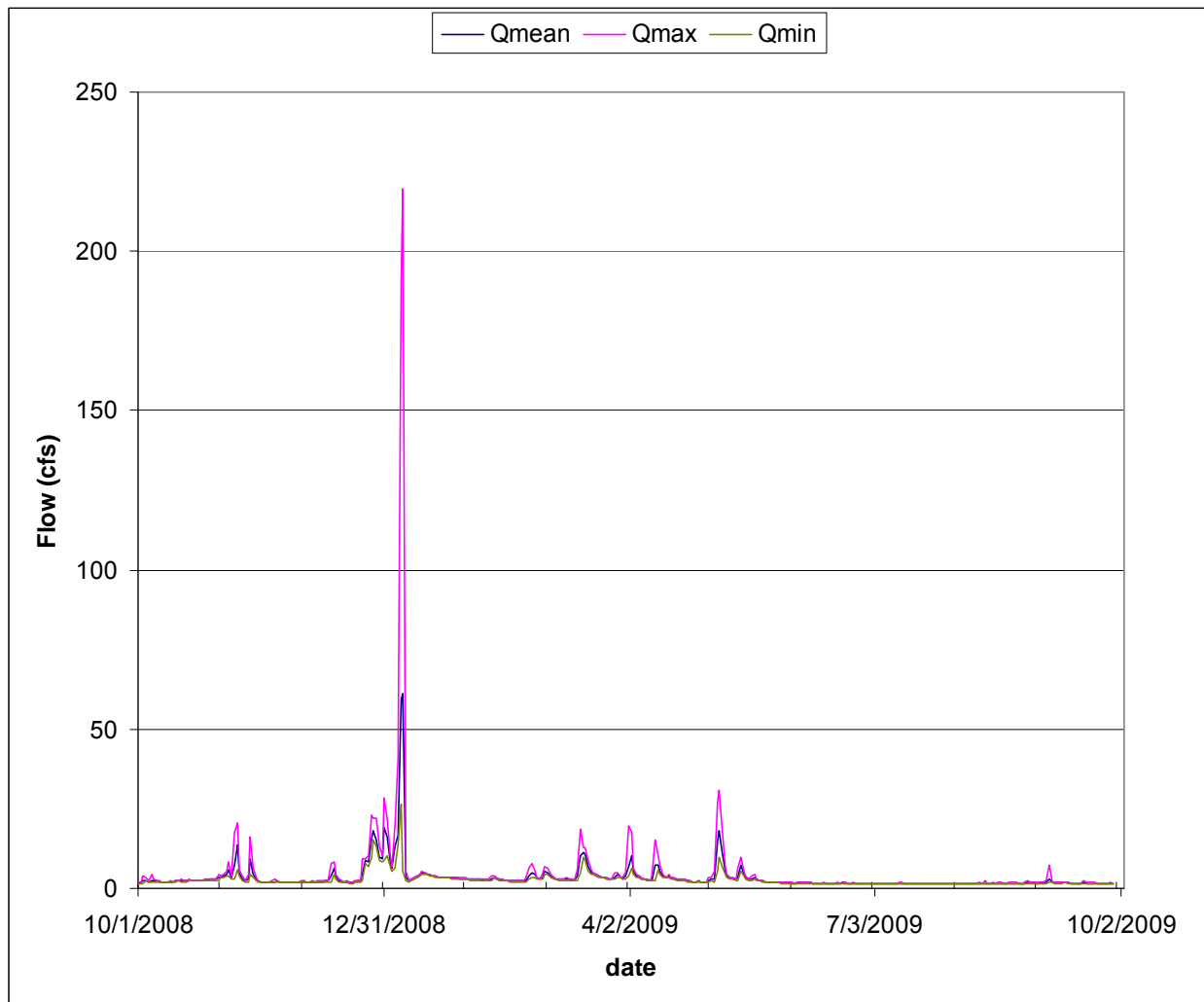


Figure 4. Hydrograph of daily stream flows (mean, maximum and minimum) for the Shingle Mill Creek site, gauge 43A. The time period shown is for the water year 2009.

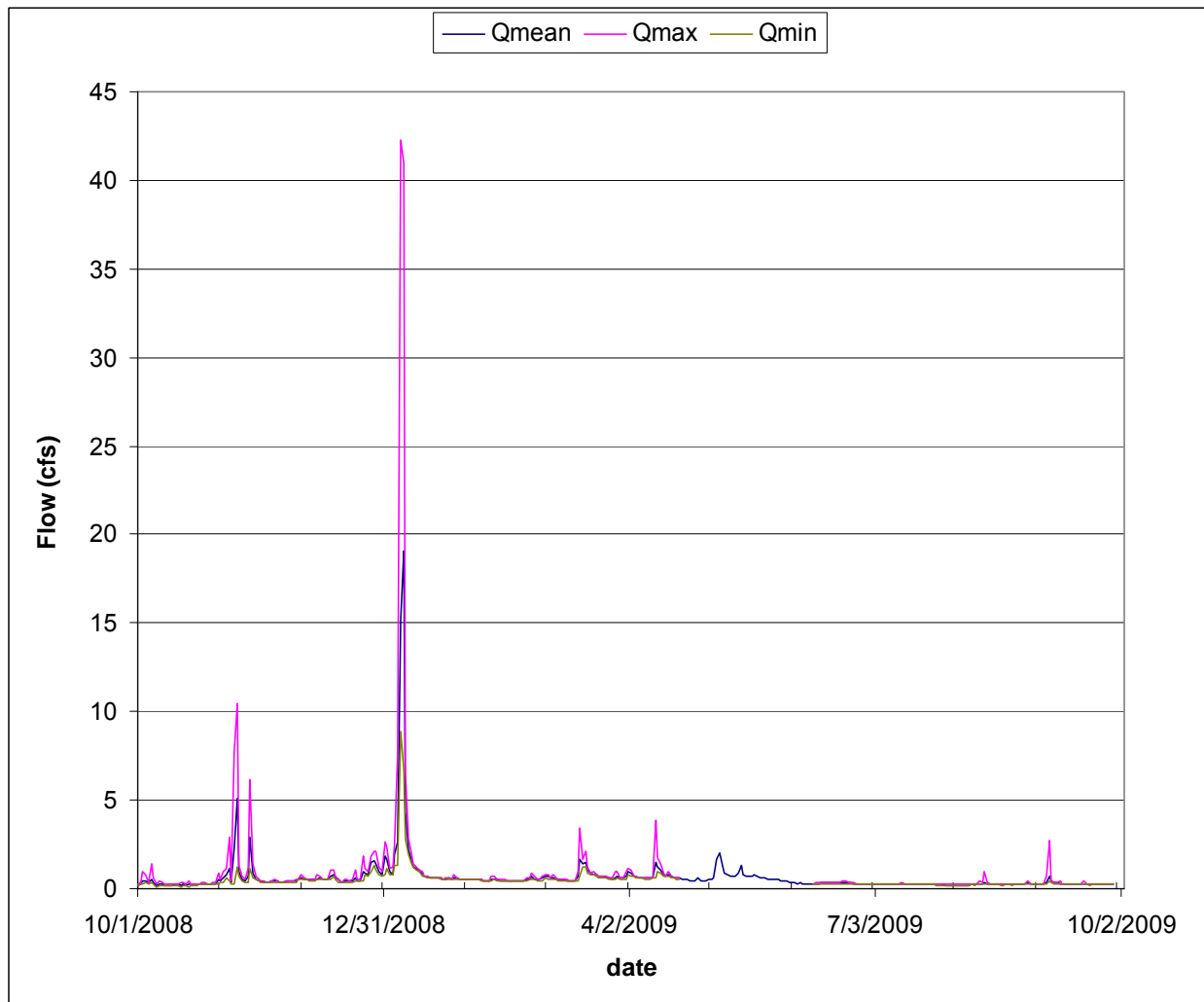


Figure 5. Hydrograph of daily stream flows (mean, maximum and minimum) for the Tahlequah Creek site, gauge 65A. The time period shown is the water year 2009.

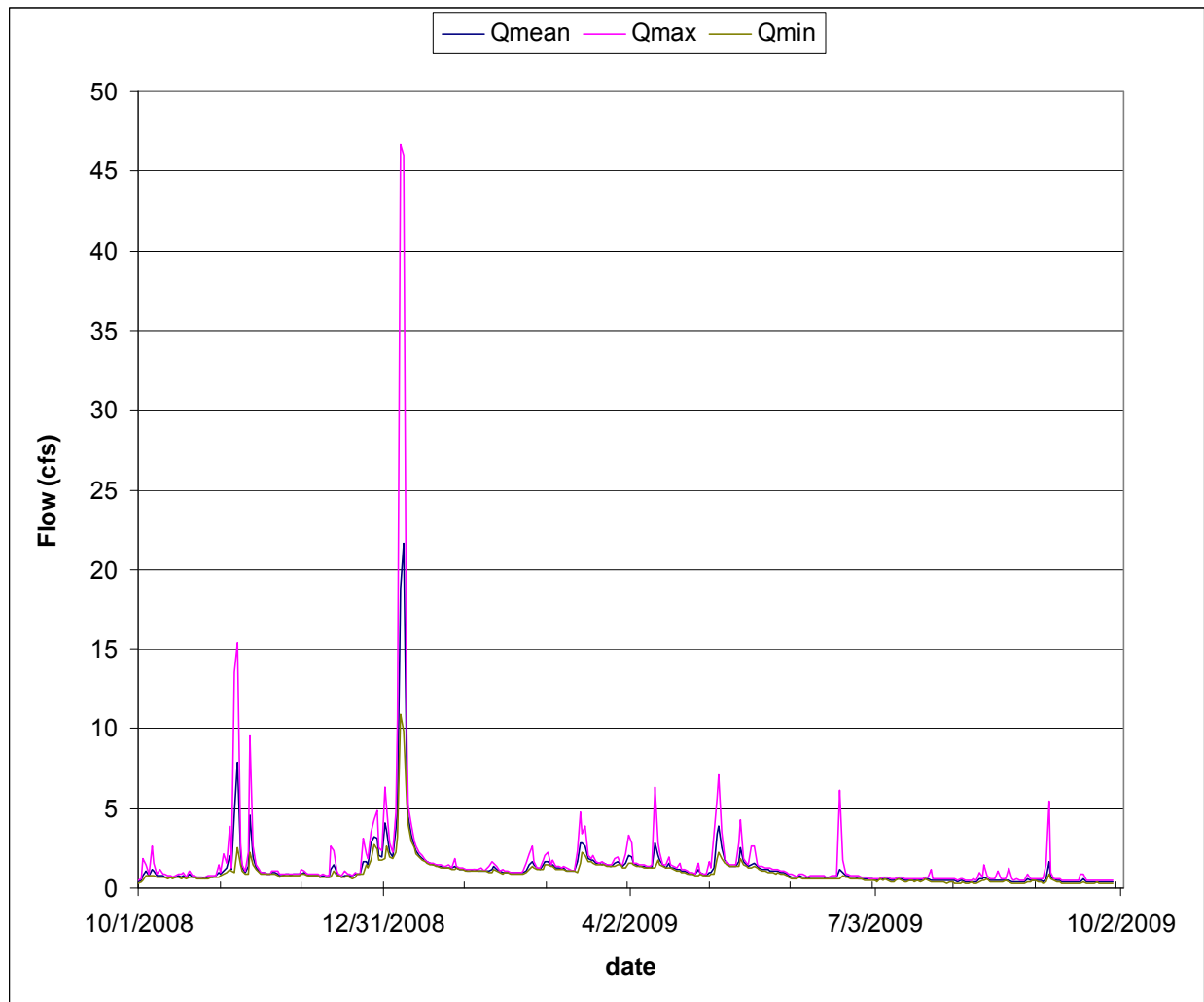


Figure 6. Hydrograph of daily stream flows (mean, maximum and minimum) for the Fisher Creek site, gauge 65B. The time period shown is the water year 2009.

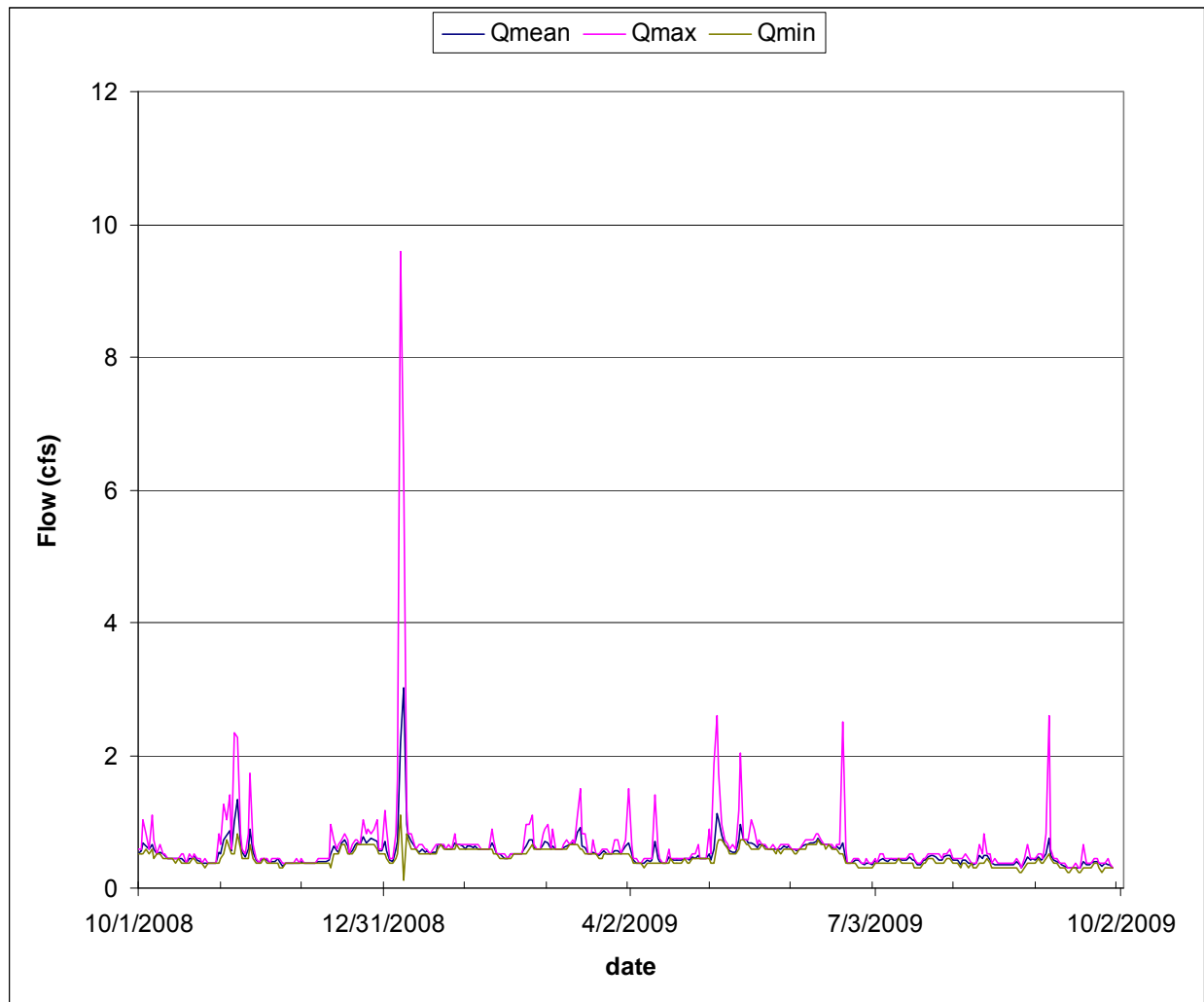


Figure 7. Hydrograph of daily stream flows (mean, maximum and minimum) for the Green Valley Creek site, gauge 65C. The time period shown is the water year 2009.

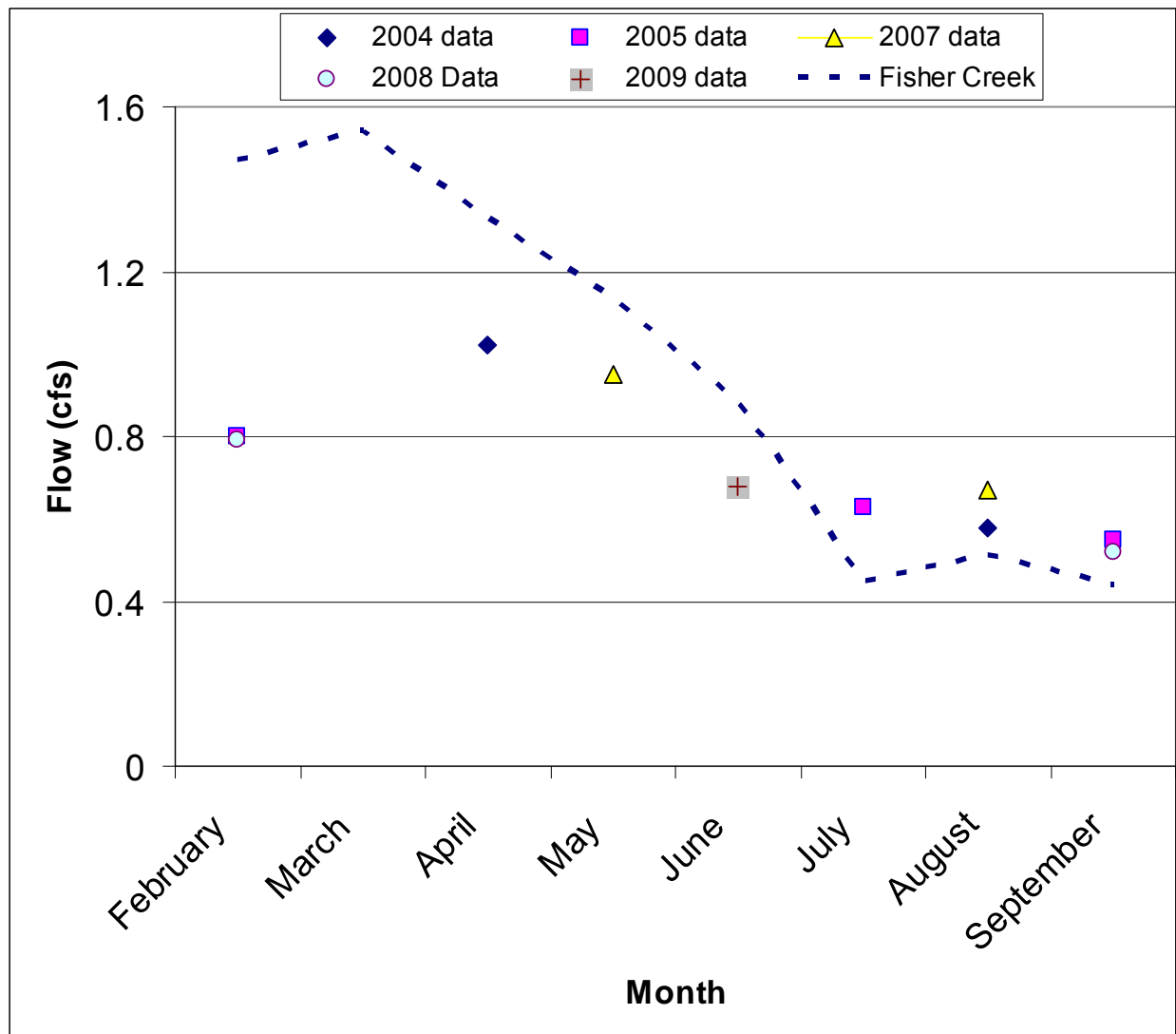


Figure 8. Typical hydrograph for the Island-wide stream gauge sites showing a decrease in stream flow from late winter/spring through early fall. This location is Christensen Creek, gauge VA23, and has been measured twice a year since April 2004. Fisher Creek data as monthly mean flow (cfs) is shown to help visualize the typical hydrograph.

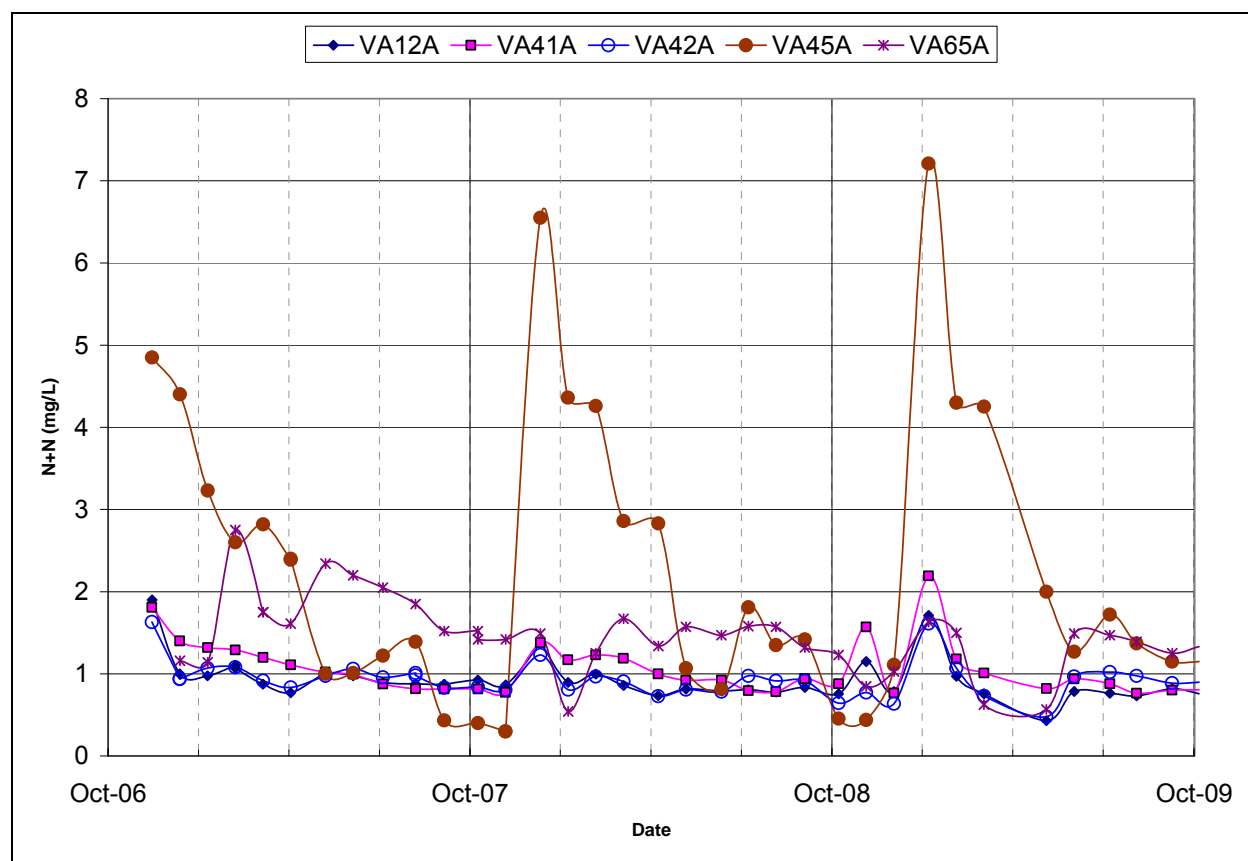


Figure 9. Nitrate + Nitrite water quality data from Vashon-Maury Island Creeks since November 2006 to September 2009. The sites sampled are Shingle Mill (VA12A), Fisher (VA41A), Judd (VA42A), Mileta (VA45A), and Gorsuch Creek (VA65A).

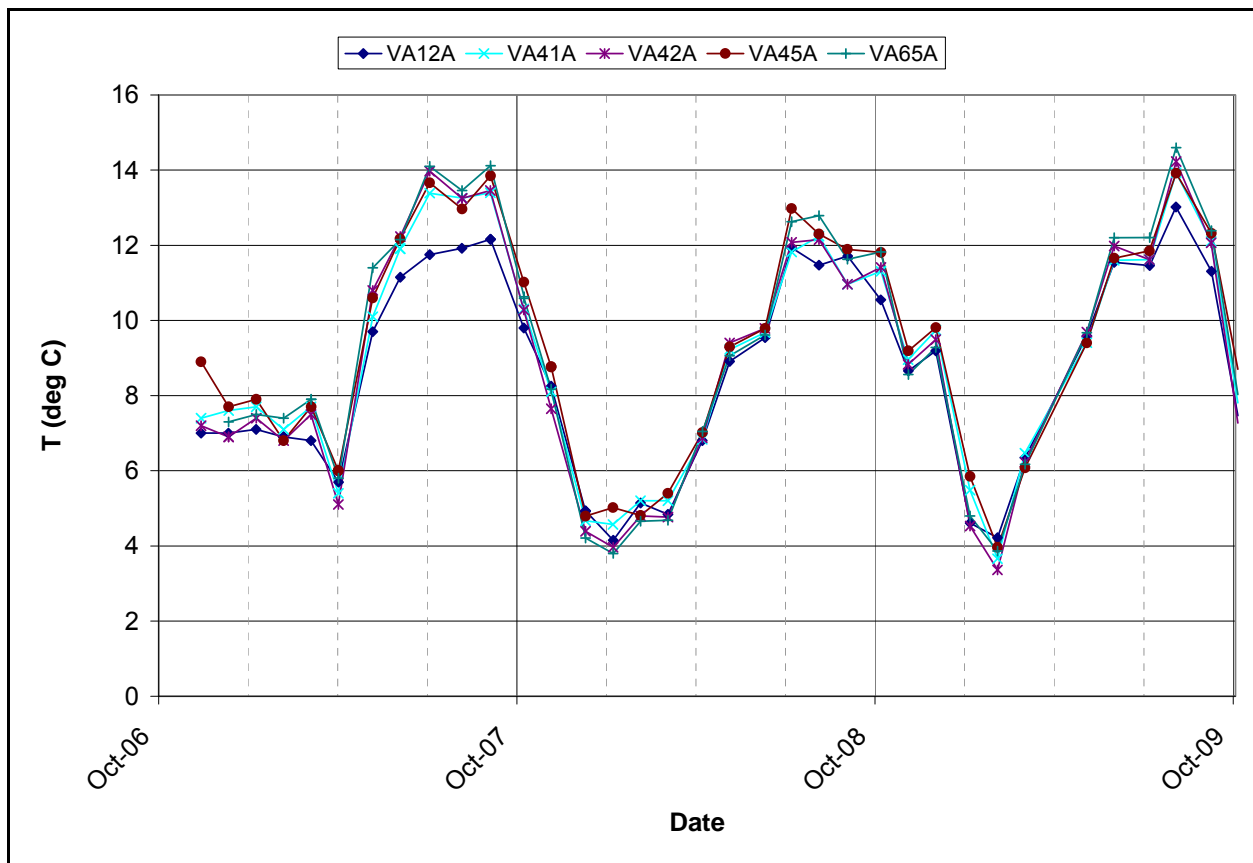


Figure 10. Temperature data from Vashon-Maury Island Creeks from November 2006 to September 2009. Data collected monthly at five stream sites: Shingle Mill (VA12A), Fisher (VA41A), Judd (VA42A), Mileta (VA45A), and Gorsuch Creek (VA65A).

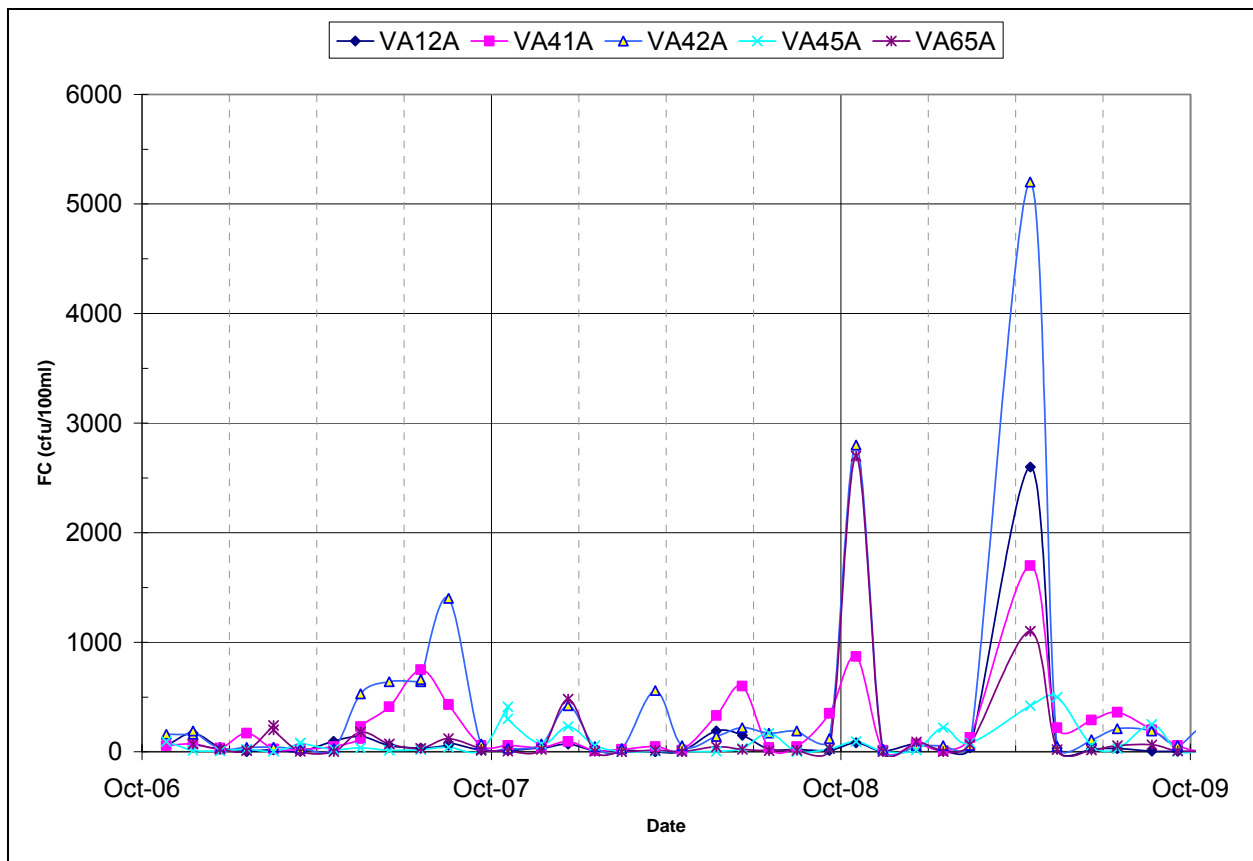


Figure 11. Fecal Coliform data from VMI Streams from November 2006 to September 2009. Data collected monthly at five stream sites: Shingle Mill (VA12A), Fisher (VA41A), Judd (VA42A), Mileta (VA45A), and Gorsuch Creek (VA65A).

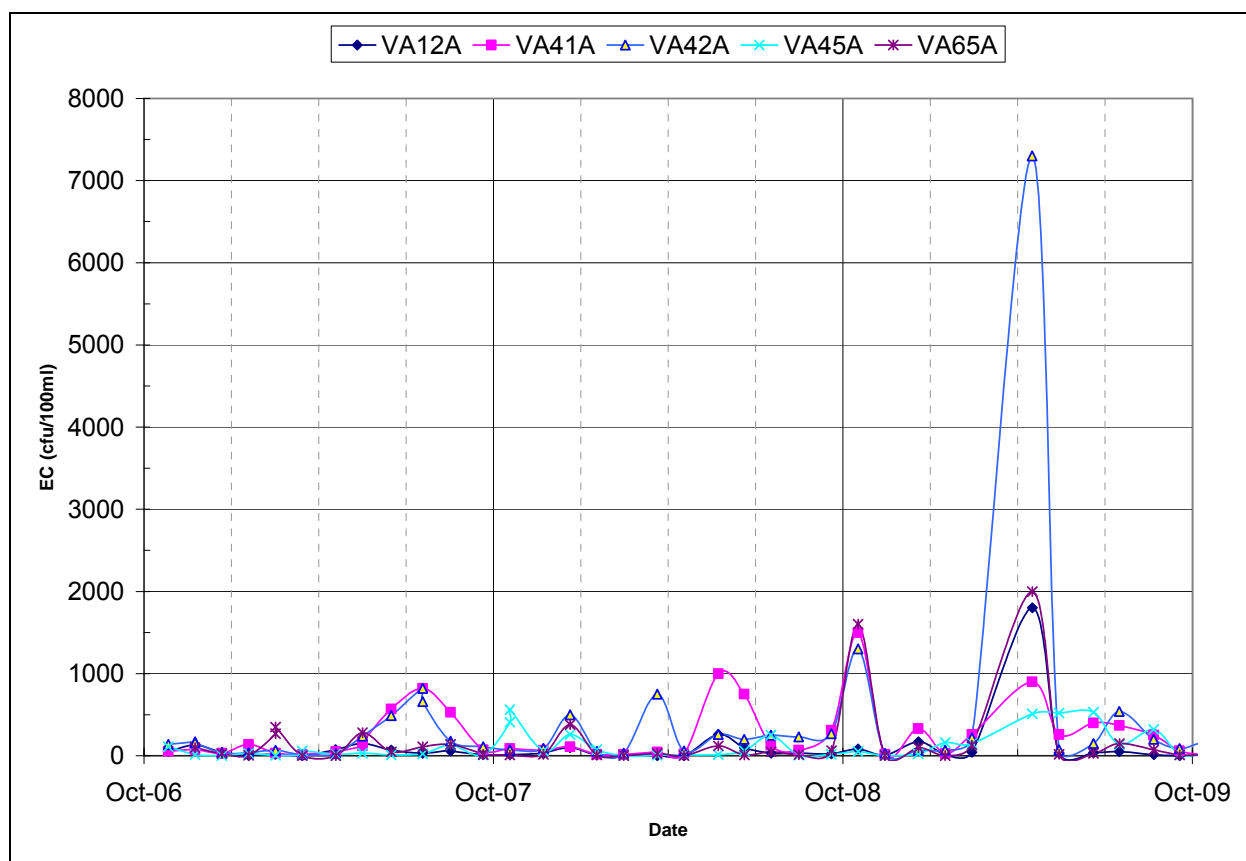
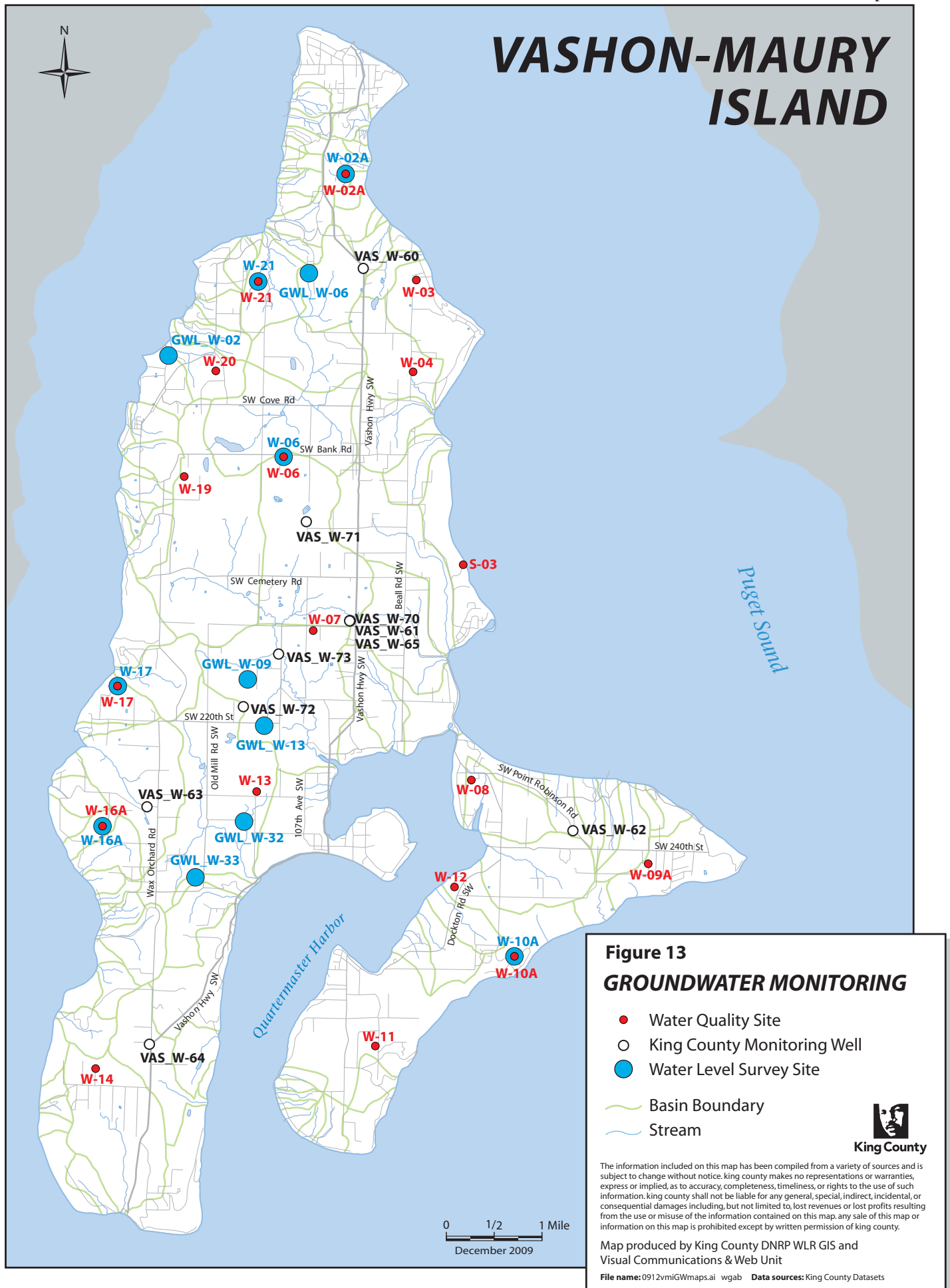


Figure 12. E. Coli data from VMI Streams from November 2006 to September 2009. Data collected monthly at five stream sites: Shingle Mill (VA12A), Fisher (VA41A), Judd (VA42A), Mileta (VA45A), and Gorsuch Creek (VA65A).



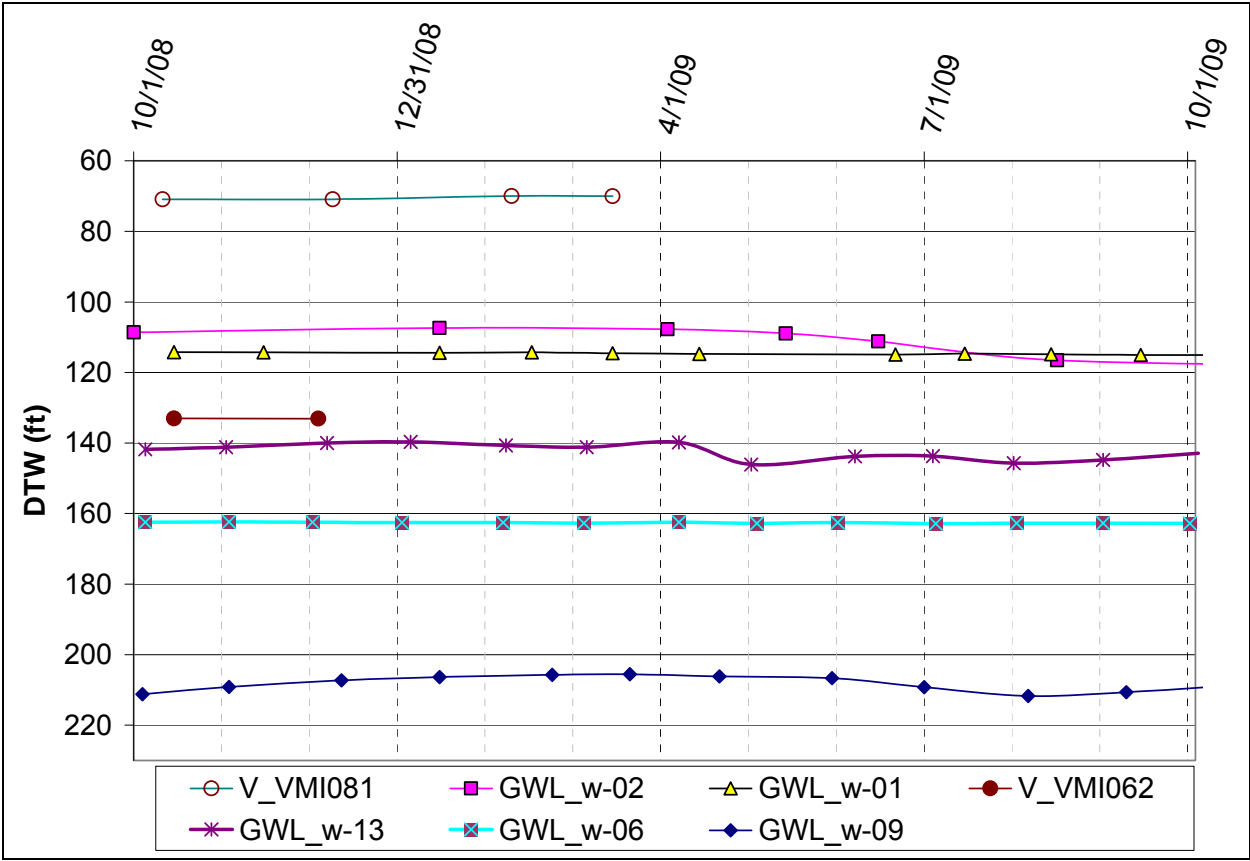


Figure 14. Depth to water (DTW) measurements in feet below land surface at the seven volunteer sites on VMI during the Water Year 2009. Note: Two volunteers (V_VMI062 and V_VMI081) stopped participating in water level measurement program during the water year

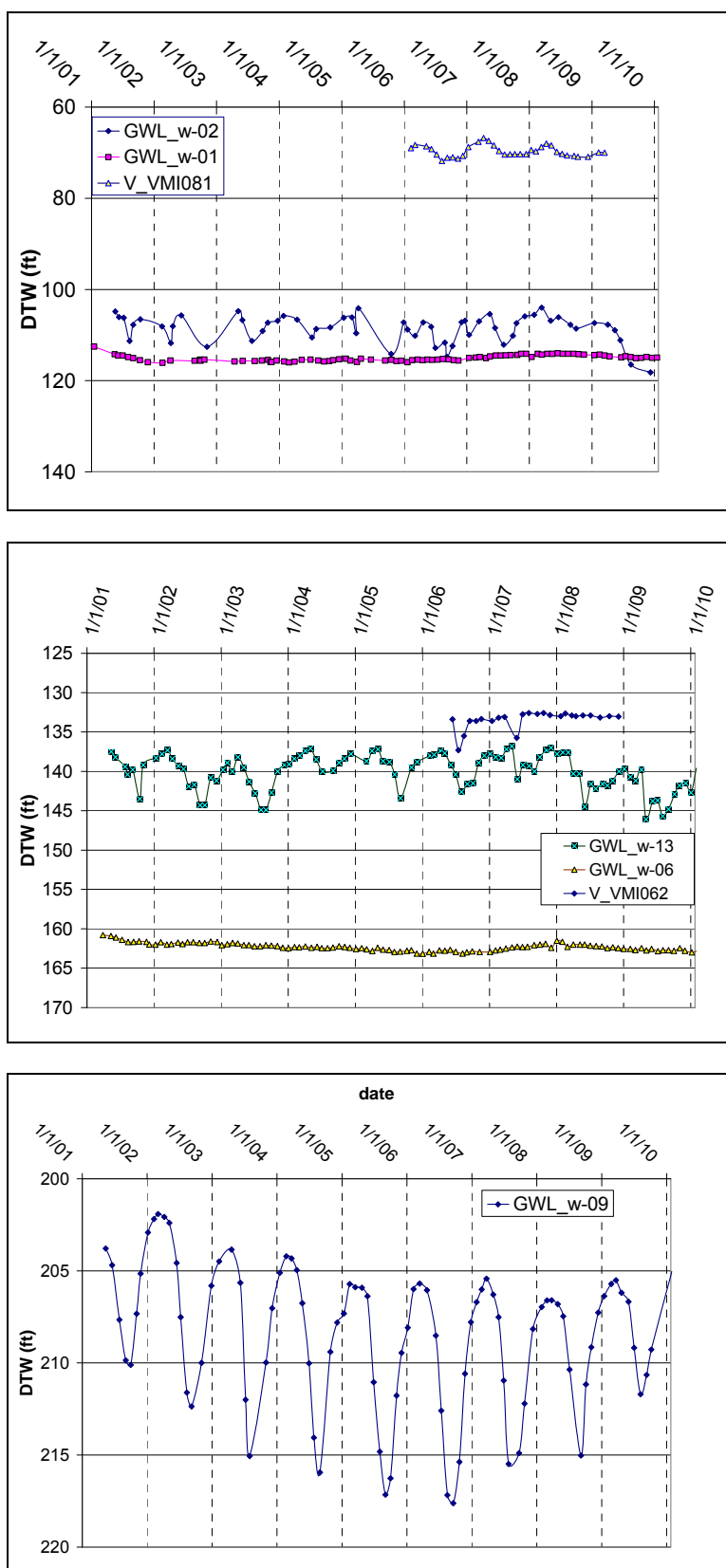


Figure 15. Depth to water (DTW) measurements in feet below land surface for the volunteer monitoring sites since 2001.

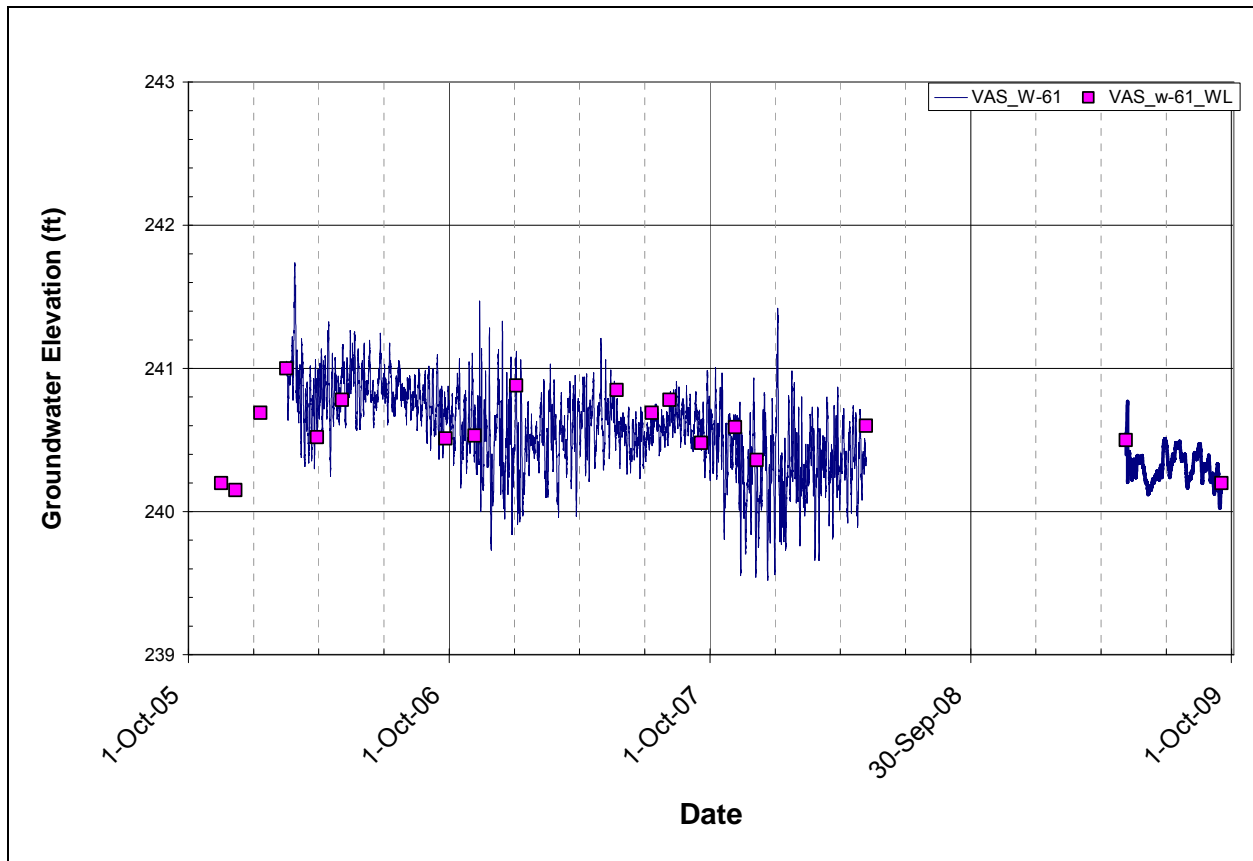


Figure 17. Water table elevations for site VAS_w-61, Valley Center Park-n-Ride 2” well, based on continuous levellogger water level data and manual depth to water measurements. Levellogger data collection started 15Feb2006. Depth to water measurements are presented as points for the dates measured, see Table 11. Equipment failure and replacement occurred in 2009.

Note VAS_W-62 does not have data presented due to the lack of water in the screen zone.

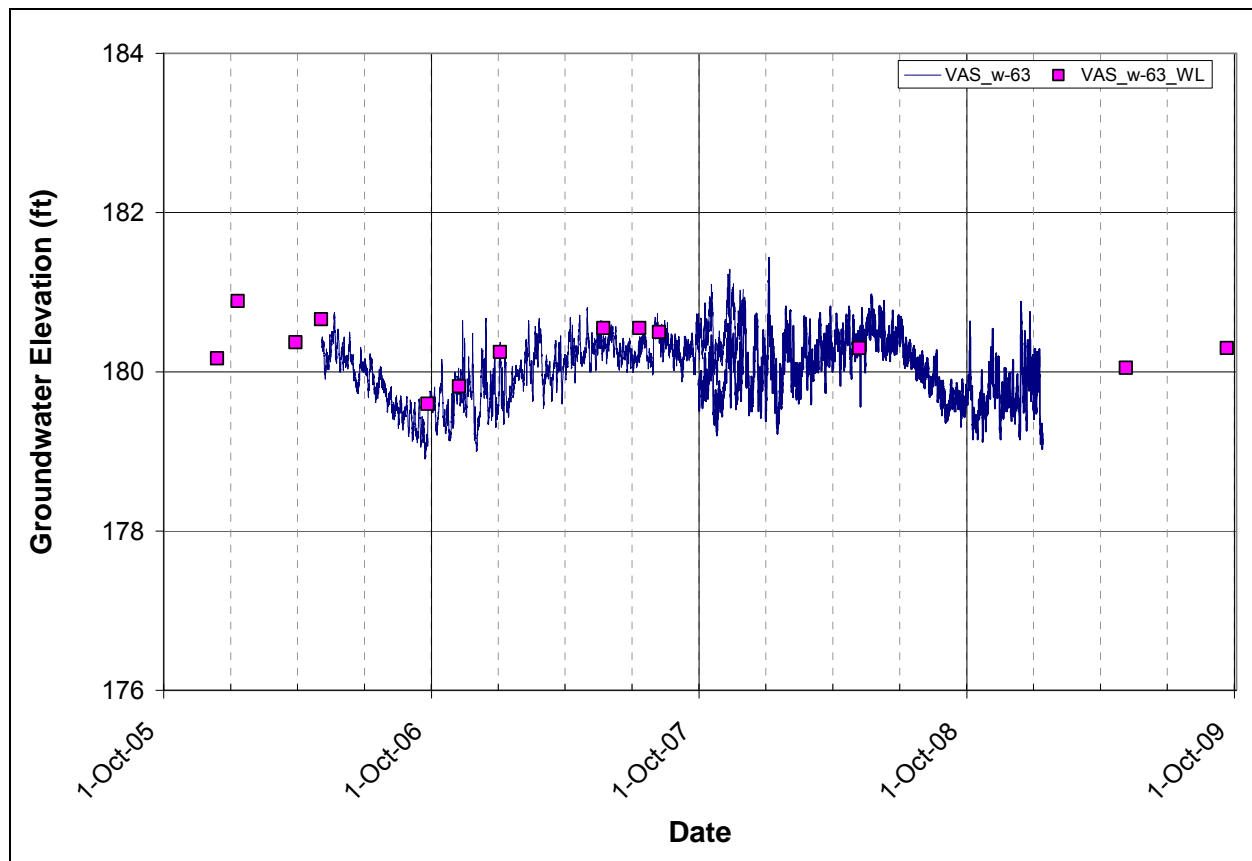


Figure 18. Water table elevations for site VAS_w-63, Redding Beach Rd, based on continuous levellogger water level data and manual depth to water measurements. Levellogger data collection started May 4, 2006. Depth to water measurements are presented as points for the dates measured, see Table 11. Equipment and deployment failure occurred in 2009 that resulted in the loss of data.

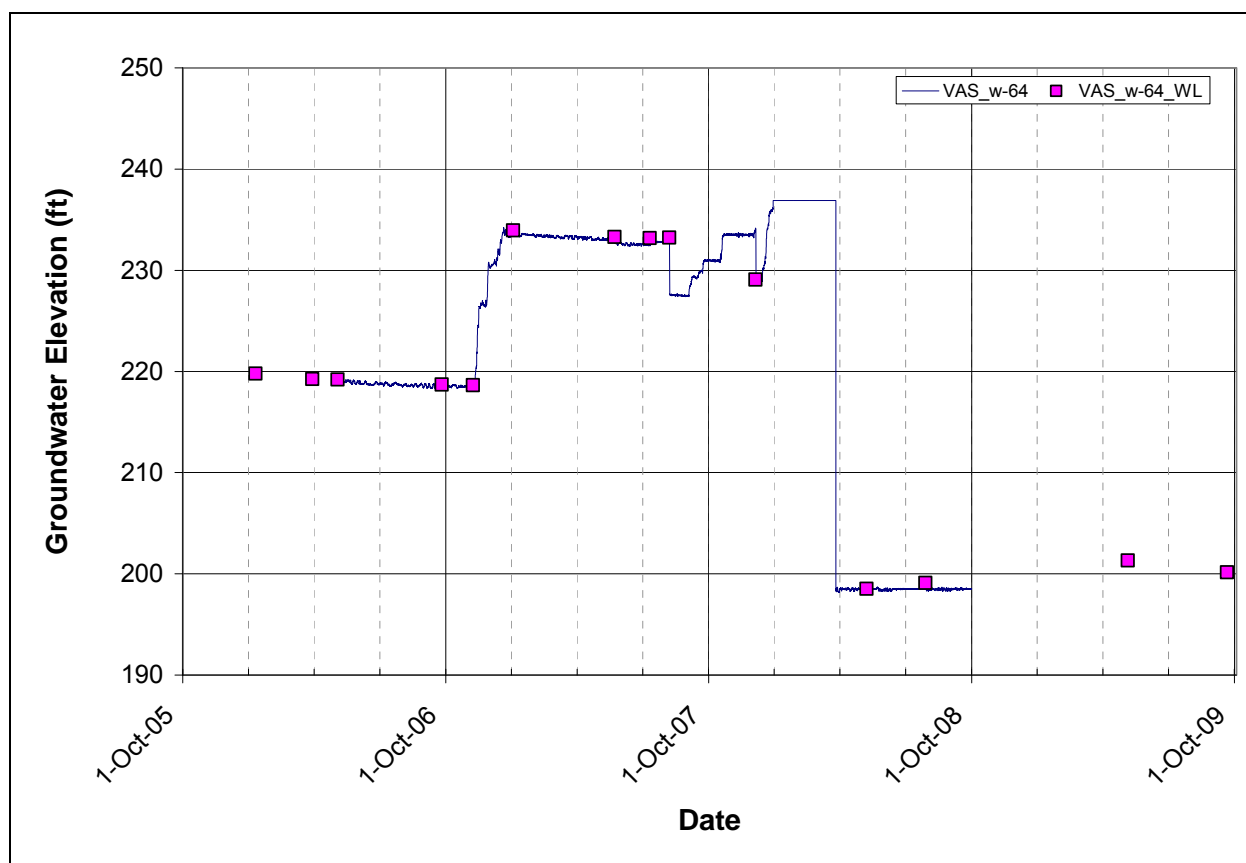


Figure 19. Water table elevations for site VAS_w-64, Wax Orchard Rd @ Vashon Hwy, based on continuous levellogger water level data and manual depth to water measurements. Levellogger data collection started November 6, 2006. Depth to water measurements are presented as points for the dates measured, see Table 11. Equipment problems occurred in 2009 – no data available: probe out of water.

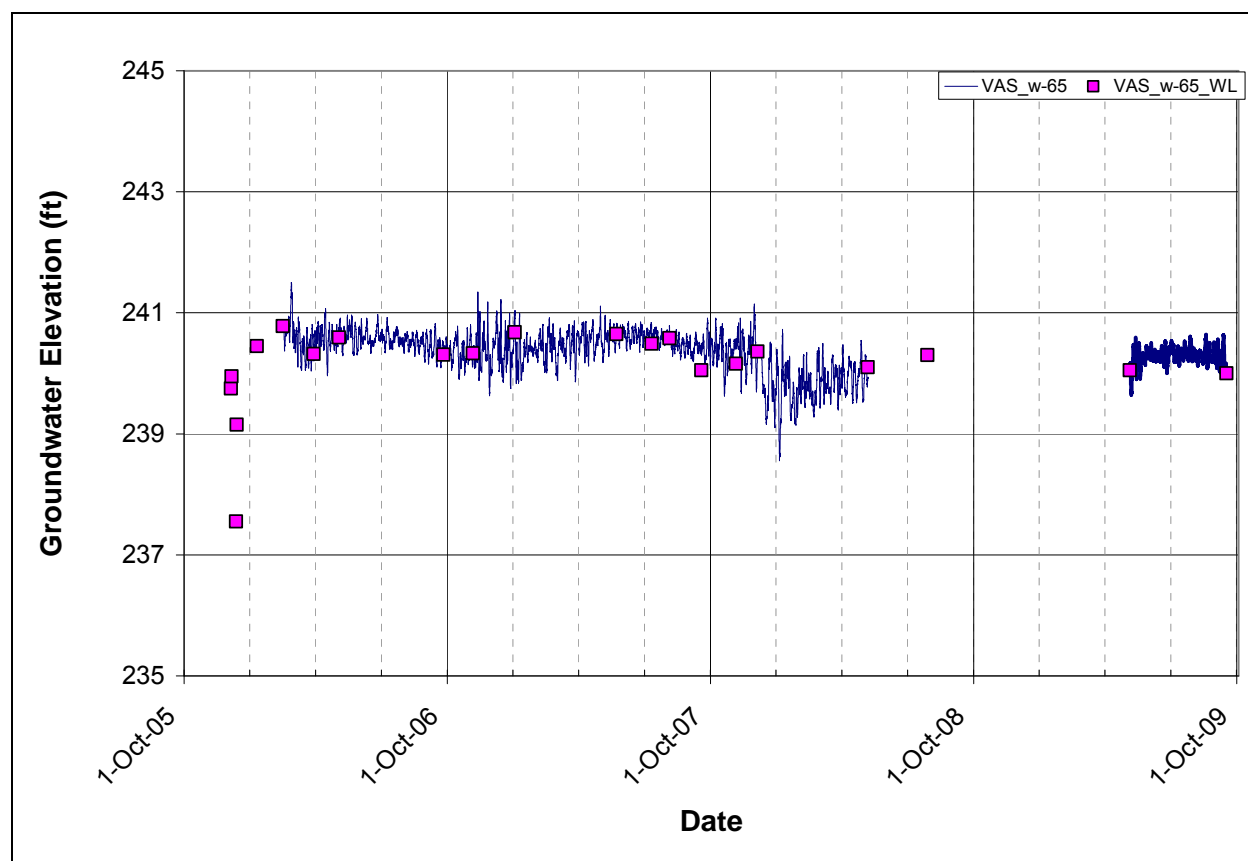


Figure 20. Water table elevations for site VAS_w-65, Valley Center Park-n-Ride 6” well based on continuous levellogger water level data and manual depth to water measurements. Levellogger data collection started February 15, 2006. Depth to water measurements are presented as points for the dates measured, see Table 11. Equipment failure and replacement occurred in 2009.

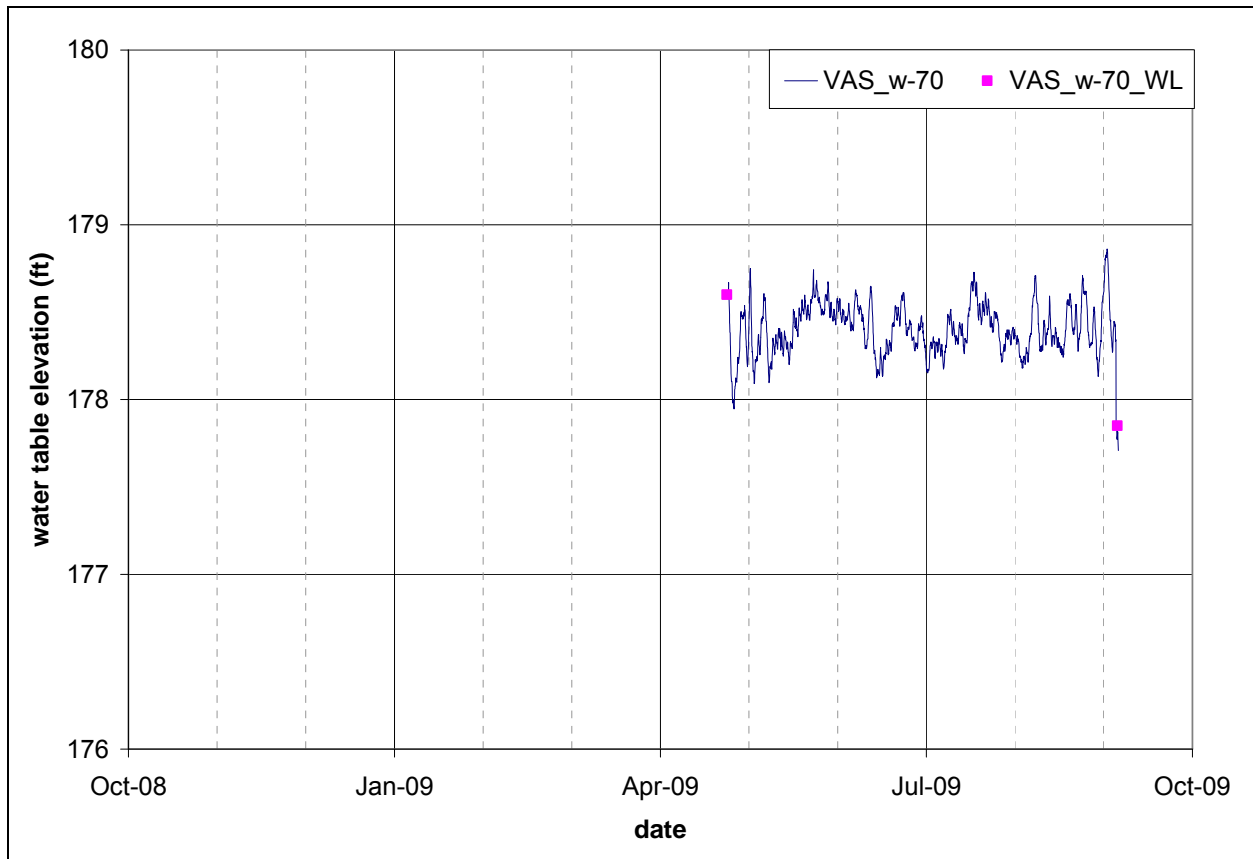


Figure 21. Water table elevations for site VAS_w-70, Valley Center Park-n-Ride Deep well based on continuous levellogger water level data and manual depth to water measurements. Diver data collection started May 6, 2009. Depth to water measurements are presented as points for the dates measured, see Table 11.

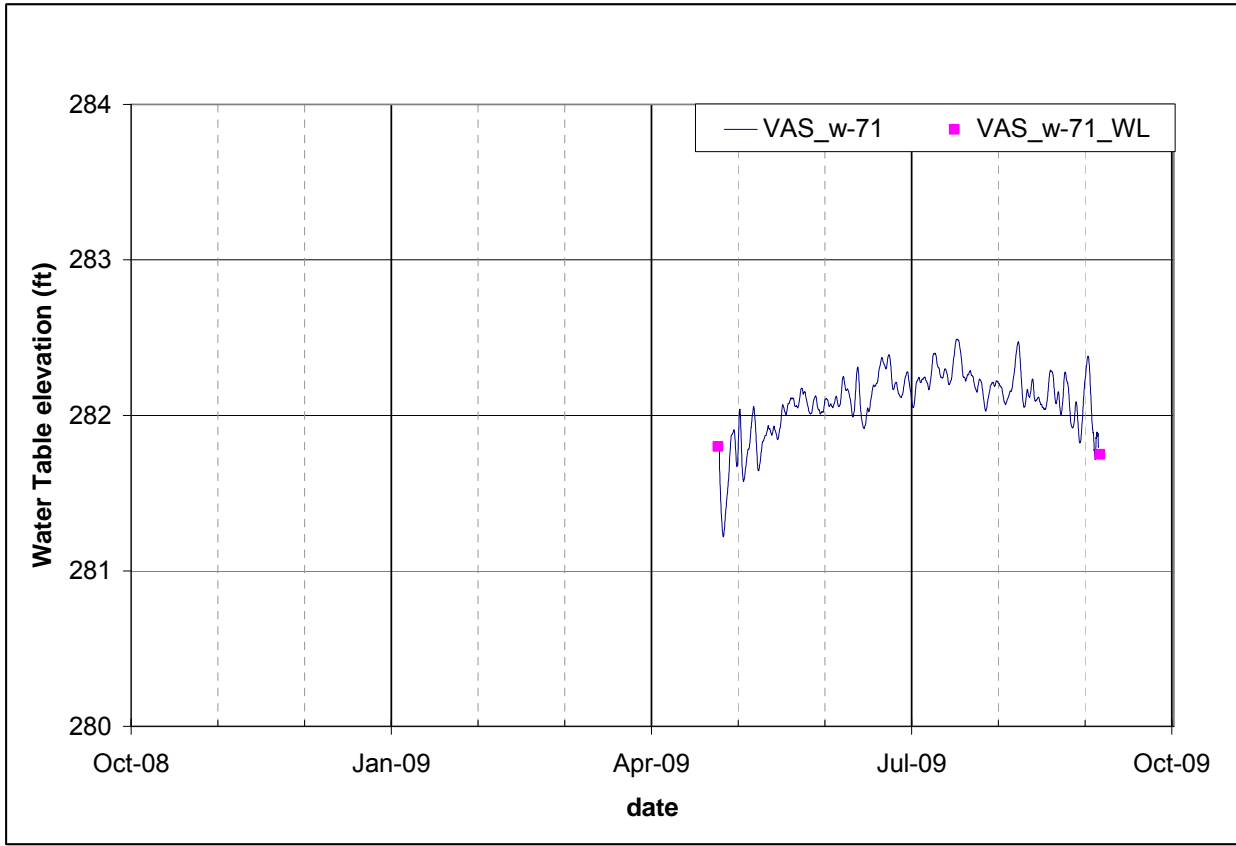


Figure 22. Water table elevations for site VAS_w-71, Island Center Forest well based on continuous levellogger water level data and manual depth to water measurements. Diver data collection started May 6, 2009. Depth to water measurements are presented as points for the dates measured, see Table 11.

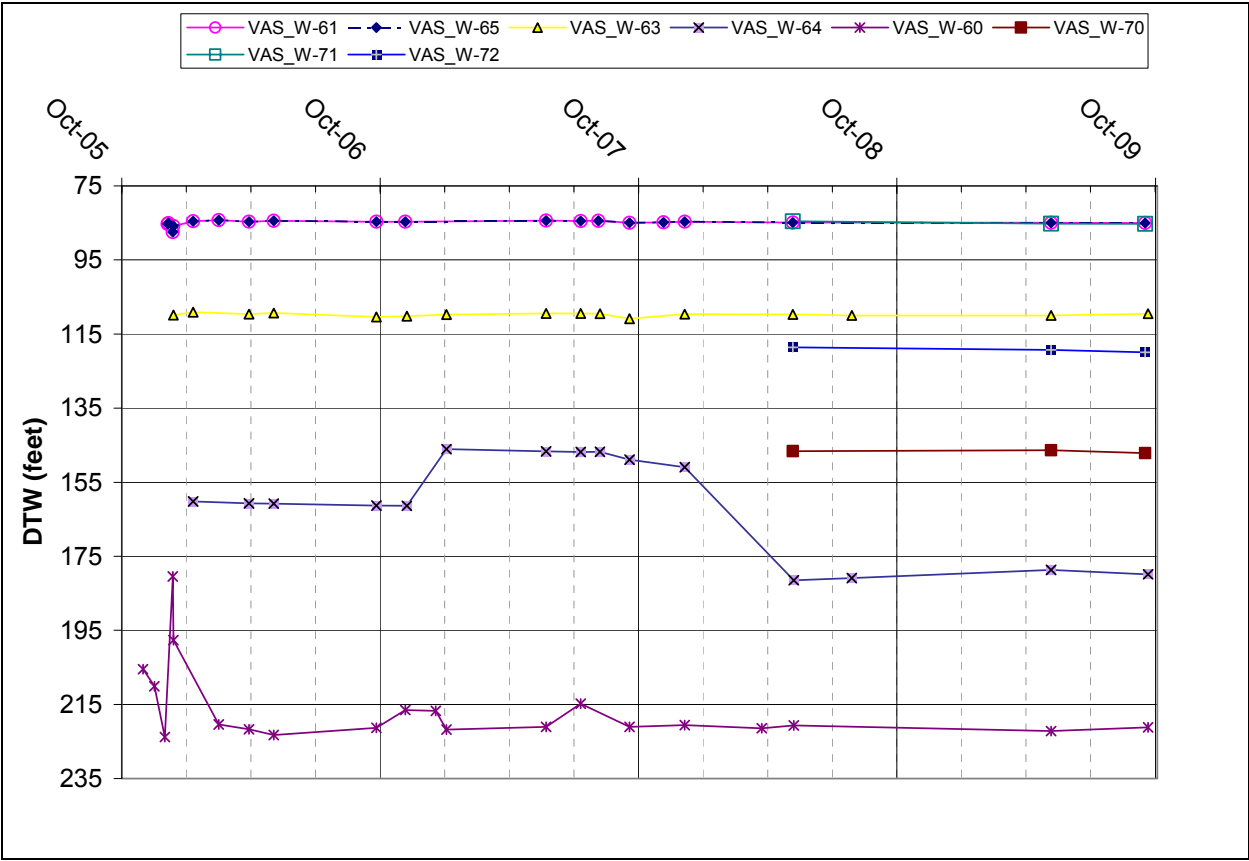
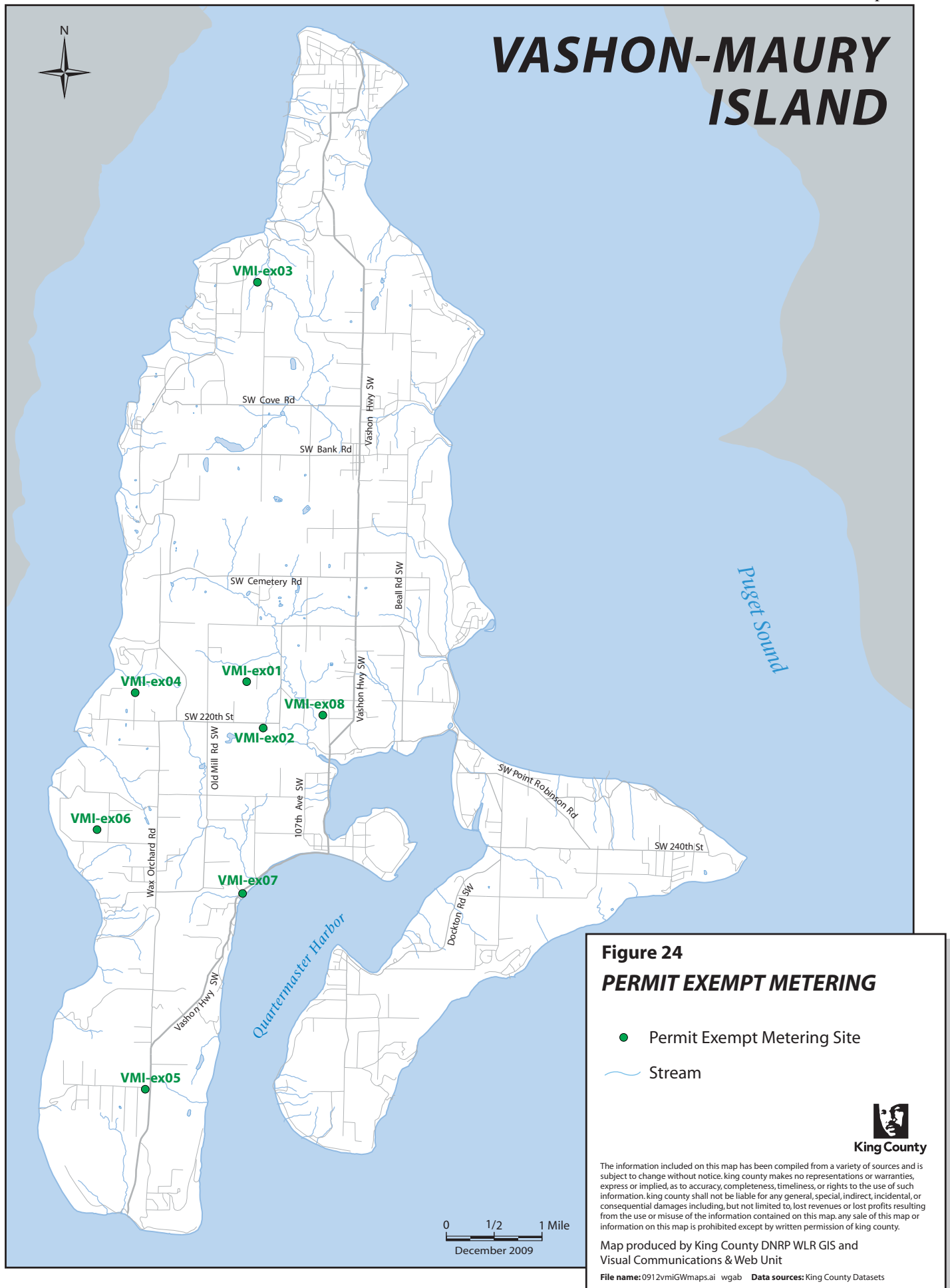


Figure 23. Depth to water (DTW) measurements for the monitoring wells on VMI since October 2005 to present. Not shown on this scale is VAS_w-73 with DTW data of ~9.7 feet below land surface.



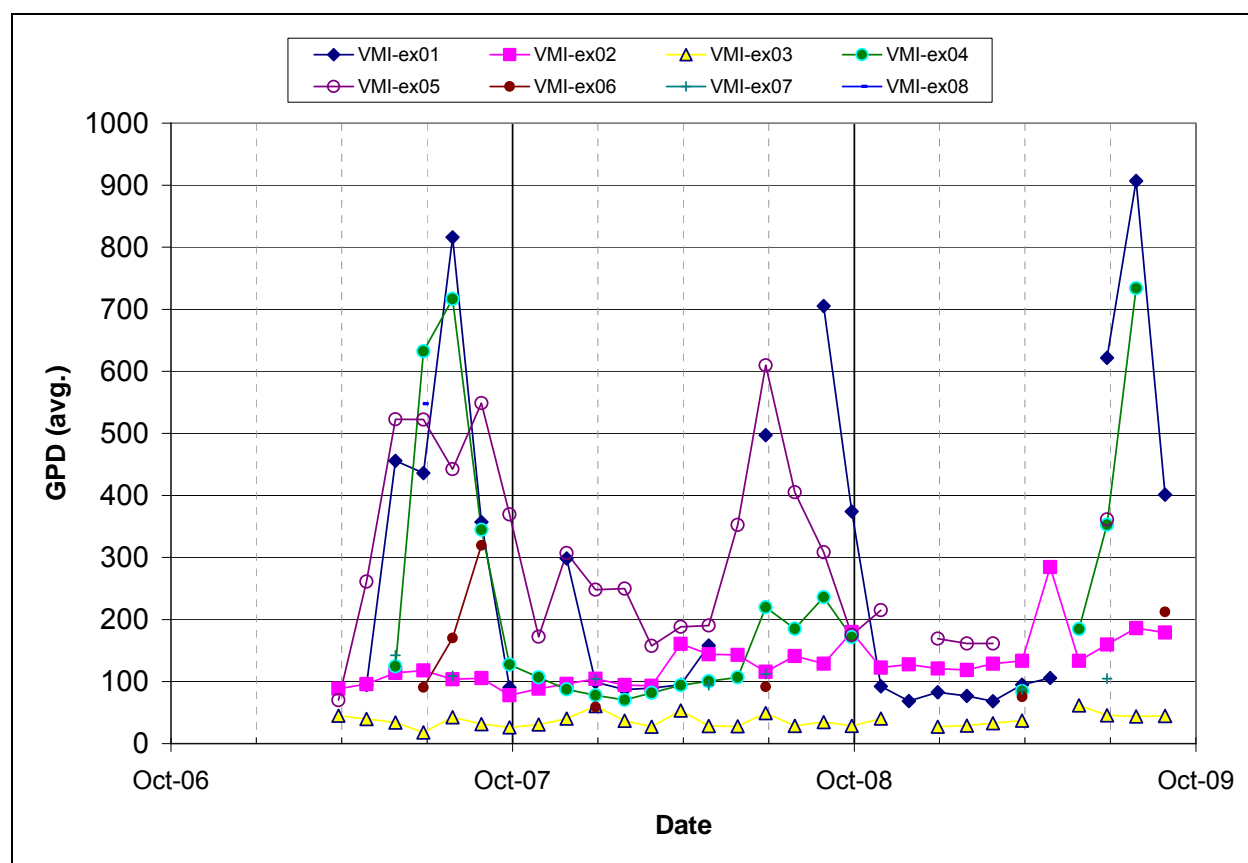


Figure 25. Average daily usage of permit exempt wells on VMI since April 2007 through water year 2009 from eight volunteer locations.

Table 1. Precipitation Gauge Sites on Vashon-Maury Island with difference in rainfall totals for water year 2009 to 2008.

Gauge Id	Gauge Name	Date Started	Total Precipitation (inches)		Difference 2009 - 2008
			WY 2009	WY 2008	
28Y	West Judd Creek (Transfer Station)	Oct-5-04	37.0	38.7	-1.7
36U	Maury Island (KIRO)	Oct-5-04	35.1	28.5*	*
36V	East Maury Island (marine park)	Mar-25-05	19.1*	27.4*	*
43U	North Vashon (Heights Water Office)	Sep-20-99	39.0	43.8	-4.8
65U	South Vashon (Tahlequah)	Nov-5-04	40.1	36.3	+3.8
Sea-Tac	Sea-Tac airport (area reference)	1971^	34.0	34.1	-0.1

“^” = refers to the year that precipitation annual averages started – the annual average for Sea-Tac is 37.2 measured 1971-2000.

“*” = refers to sites that have incomplete data record for the time period measured and differences were not calculated.

WY = Water Year which is a 12 month period from October 1st to September 30th. Example: Water Year 2009 is from October 1, 2008 to September 30, 2009.

Table 2. Monthly rainfall totals in inches for Water Year: 2009 and 2008

Water Year	Site	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	YTD Total
WY09	28Y	2.5	7.9	3.4	6.4	1.7	3.6	3.5	4.7	0.6	0.1	0.8	1.7	37.0
	36U	2.5	7.2	4.2	5.9	1.3	3.5	3.0	3.7	0.7	0.0	1.0	1.9	35.1
	36V	2.3	7.1	3.1	4.5	1.3	0.9*	—*	—*	—*	—*	—*	—*	19.1*
	43U	2.6	7.9	4.0	6.0	2.0	4.3	3.5	4.9	0.4	0.1	1.1	2.3	39.0
	65U	3.0	8.0	3.9	7.3	1.5	4.3	3.9	4.5	0.5	0.1	1.2	2.0	40.1
	SeaTac	2.2	6.5	4.1	5.4	1.5	4.2	3.4	3.6	0.2	0.1	1.2	1.8	34.0

YTD Total = Year to date total of the monthly precipitation.

WY = Water Year – a 12 month period starting October 1st through September 30th; WY09 is from October 2008 through September 2009.

“*” = refers to sites that have incomplete data record for that month.

—* - refers to month with no data

Water Year	Site	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	YTD Total
WY08	28Y	3.5	4.0	11.3	5.9	1.7	4.4	1.9	0.8	1.7	0.2	2.6	0.6	38.7
	36U	3.1	3.4	9.6	4.9	1.4	3.8	1.4	0.4	0.1	0.4	—*	—*	28.5*
	36V	1.6*	3.3	7.5	4.0	1.2	3.6	1.3	1.4	0.3	0.5	2.2	0.6	27.4*
	43U	3.7	4.4	13.4	6.0	2.1	5.2	2.2	1.0	1.7	0.3	3.3	0.7	43.8
	65U	3.5	3.8	10.0	5.8	1.8	4.0	1.5	1.1	1.3	0.2	2.8	0.5	36.3
	SeaTac	3.3	3.7	9.1	4.3	1.8	3.7	1.9	0.9	1.6	0.5	2.9	0.8	34.1

WY08 is from October 2007 through September 2008.

“*” = refers to sites that have incomplete data record for the time period measured.

—* - refers to month with no data.

Table 3. Comparison of precipitation totals by Water Year (Oct-Sep) for all precipitation gauge sites on Vashon-Maury Island. The units are inches. Sea-Tac site shown as an area reference.

Water Year	28Y Judd Creek	36U Maury Island	36V East Maury Is.	43U North Vashon	65U South Vashon	Sea-Tac
2005	39.2	31.9	12.5*	36.6	31.2*	30.6
2006	46.8	43.7	35.8	44.1	45.9	39.5
2007	54.0	50.6	25.0*	61.6	54.2	47.3
2008	38.7	28.5*	27.4*	43.8	36.3	34.1
2009	37.0	35.1	19.1*	39.0	40.1	34.0

Water Year – a 12 month period starting October 1st through September 30th; example WY09 is from October 2008 through September 2009

Precipitation Totals is calculated by adding the daily precipitation for each site.

“*” = refers to sites that have incomplete data record for the time period measured.

Table 4. An annual summary of flow data based on the water year for all continuous stream gauge sites on Vashon-Maury Island.

Gauge Id	Gauge Name	Date Started	Q_{mean} (cfs)	Q_{max} (cfs)	Q_{min} (cfs)
28A	Judd Creek	Jul-16-99	4.8	311.9	1.2
43A	Shingle Mill Creek	Jul-9-98	3.4	219.9	1.3
65A	Tahlequah Creek	May-1-04	0.6	42.3	0.1
65B	Fisher Creek	May-1-04	1.2	46.7	0.3
65C	Green Valley Creek	Mar-25-05	0.5	9.6	0.1

Q_{mean} = Mean daily flow recorded for a given site.

Q_{max} = Maximum daily flow recorded for a given site.

Q_{min} = Minimum daily flow recorded for a given site.

(cfs) = cubic feet per second; the unit of measurement for stream flow.

Table 5. Comparison of Stream Flow by Water Year (Oct-Sep) for all continuous stream gauge sites on Vashon-Maury Island. All units are cfs of Qmean.

Water Year	28A Judd Creek	43A Shingle Mill Creek	65A Tahlequah Creek	65B Fisher Creek	65C Green Valley Creek
1999	2.56*	7.63	--	--	--
2000	6.67	5.67	--	--	--
2001	3.82	2.66	--	--	--
2002	6.68	5.05	--	--	--
2003	4.87	3.85	--	--	--
2004	5.92	4.43	--	--	--
2005	3.42	3.03	0.48	1.01	0.45*
2006	6.12	4.55	0.92	1.68	0.50*
2007	5.94*	5.77	1.16	2.13	0.62
2008	4.93	3.77	0.53	1.35	0.60
2009	4.76	3.44	0.64	1.23	0.53

Q_{mean} = Mean daily flow for measured time period of water year (WY).

Water Year – a 12 month period starting October 1st through September 30th; example WY09 is from October 2008 through September 2009

(cfs) = cubic feet per second; the unit of measurement for stream flow.

-- = No data for this site for this water year.

“*” = refers to sites that have incomplete (estimated) data record for the time period measured.

Table 6. Instantaneous flow measurements at stream gauge sites measured semi-annually as part of the Island-wide assessment of stream flow.

Stream number	Stream Name	10/1-2 2008	6/9-11/2009
		Q (cfs)	Q (cfs)
17A	McCormick Creek	0.24	0.20
43A	Shingle Mill Creek	1.68	1.66
VA12c	Shingle Mill above Needle Creek	1.24	1.28
VA12d	Needle Creek	0.19	0.20
VA20	Robinwood Creek	0.38	0.35
65C	Green Valley Creek	0.53	0.68
VA23	Christensen Creek	0.52	0.59
VA30	Bates Creek	0.04	0.06
65A	Tahlequah Creek	0.24	0.30
65B	Fisher Creek	0.59	0.73
28A	Judd Creek @ SW 204th	0.49	0.52
VA42b	East Fork Judd Cr @ SW 204th	0.4	0.5
VA42	Judd Creek near Mouth	1.51	2.01
VA42c	Judd Creek @ Singer Rd	not meas	0.39
VA42d	Judd Cr @ 111th SW	0.70	0.96
VA42e	Judd Cr @ 107th SW	0.98	1.39
VA43	Tsugwalla Creek	0.03	0.05
VA44	Raab's Creek	0.001 est	.01
VA45	Mileta Creek	0.001 est	0.001 est
VA62	Ellis Creek	0.10	0.003 est
VA63	Ellisport Creek	not meas	0.28
VA64	Beall Creek - upstream of withdrawal	0.72	0.70
VA65	Gorsuch Creek	0.05	0.08
VA66	Dilworth Creek	0.03	0.06
VA67	Glen Acre Creek	0.02	0.03

Q = Flow recorded for a given site.

(cfs) = cubic feet per second; the unit of measurement for stream flow.

"est" = estimated flow data due to low water.

"not meas" = Not measured during the field days.

Table 7. List of parameters sampled as part of the surface water water quality monitoring started in November 2006.

Parameters
Total Alkalinity
Total Suspended Solids
Turbidity
Total Nitrogen
Ammonia Nitrogen
Nitrite + Nitrate Nitrogen
Total Phosphorus
Orthophosphate Phosphorus
Escherichia coli
Fecal Coliform
pH, Field
Sample Temperature, Field
Dissolved Oxygen, Field
Conductivity, Field

Table 8. Depth to water data for volunteer water level sites during WY2009.

	GWL_w-01	GWL_w-02	GWL_w-06	GWL_w-09	GWL_w-13	GWL_w-32	GWL_w-33
Month	depth to water (feet)						
Oct	114.2	108.6	162.5	211.2	141.8	133.0	70.7
Nov	114.3	not meas	162.4	209.2	141.2	not meas	not meas
Dec	not meas	not meas	162.5	207.3	140.0	133.5	70.9
Jan	114.4	107.4	162.6	206.4	139.7	NP	not meas
Feb	114.3	not meas	162.6	205.7	140.7	NP	70.0
Mar	114.5	107.7	162.7	205.5	141.2	NP	70.0
Apr	114.7	not meas	162.5	206.2	139.8	NP	NP
May	not meas	108.9	162.8	206.1	146.1	NP	NP
Jun	114.9	not meas	162.6	not meas	143.8	NP	NP
Jul	114.7	not meas	162.9	209.2	143.7	NP	NP
Aug	114.9	116.5	162.7	211.7	145.7	NP	NP
Sep	115.1	not meas	162.7	210.7	144.8	NP	NP

not meas = Water level not measured that month.

NP = Not participating in the program

Table 9. The relative change of the annual average (in feet) from the baseline of the depth to water measurements done during Water Years 2004 to 2009 for the five long-term water level sites. The baseline for each site is the average of the measurements made during Water years 2002-2003. Depth to water measurements for these sites are plotted versus time in Figure 15.

	WY2002-03		WY2004		WY2005		WY2006		WY2007		WY2008		WY2009	
	baseline	count	data	count	data	count	data	count	data	count	data	count	data	count
GWL_w-01	115.7	13	0.0	8	0.2	10	0.1	9	0.8	11	1.5	11	1.1	10
GWL_w-02	108.5	11	0.8	6	1.6	5	-2.1	6	-0.4	10	2.2	10	-1.6	6
GWL_w-06	161.9	21	-0.5	12	-0.7	12	-1.1	12	-0.6	10	-0.1	10	-0.7	12
GWL_w-09	206.7	18	-1.6	7	-2.5	10	-4.2	11	-3.0	11	-2.2	11	-1.5	11
GWL_w-13	140.8	19	1.7	12	1.8	11	1.5	9	1.9	11	1.9	11	-1.6	12

Table 10. Water level measurements for long-term water quality sites on Vashon-Maury Island for 2009.

Site id	Measurement date	Depth to water (feet)
w-02a	09/15/2009	152.6
w-06	09/15/2009	146.9
w-10a	09/16/2009	85.9
w-12	09/16/2009	94.2
w-13	09/15/2009	14.1
w-16a	09/15/2009	27.7
w-17	09/15/2009	171.0
w-20	09/15/2009	90.3
w-21	09/15/2009	115.0

Table 11. Water level measurements at the dedicated groundwater monitoring wells on VMI during the WY2009.

Site id	Measurement date	Depth to water (feet)
w-60	5/7/2009	222.22
	9/21/2009	221.20
w-61	5/7/2009	84.5
	9/21/2009	84.8
w-63	5/7/2009	110.0
	9/21/2009	109.5
w-64	5/7/2009	178.7
	9/21/2009	179.9
w-65	5/7/2009	84.9
	9/21/2009	85.0
w-70	5/7/2009	146.4
	9/21/2009	147.2
w-71	5/7/2009	85.2
	9/21/2009	85.3
w-72	5/7/2009	119.3
	9/21/2009	119.9
w-73	5/7/2009	9.7
	9/21/2009	11.7

NOTE: Water levels taken within VAS_W-62 are below the screen, so these measurements are reported as “dry”.

Table 12. Environmental Indicators – Arsenic, Chloride, and Nitrate+Nitrite – sampling results at the long-term monitoring sites. Sampling occurred at 16 sites on September 15-16th2009.

Site Id	Arsenic		Chloride		Nitrate + Nitrite	
	2009 results	Avg Conc.	2009 results	Avg Conc.	2009 results	Avg Conc.
	µg/L		mg/L		mg/L	
VAS s-03	1.83	1.77	4.9	5.86	1.57	1.97
VAS w-02a	8.81	7.64	3.93	3.73	1.44	1.23
VAS w-03	1.05	1.09	8.13	7.78	0.49	0.35
VAS w-04	18.7	18.55	3.79	3.70	0.02^	0.02^
VAS_w-06*	0.96	1.02	3.21	3.07	1.28	1.22
	0.94		3.18		1.31	
VAS w-07	12.10	27.74	2.79	2.71	0.02^	0.02^
VAS w-09a	4.01	5.31	4.92	4.87	0.02^	0.02^
VAS w-10a	3.20	1.62	11.8	9.99	5.38	3.73
VAS w-12	6.04	5.87	4.13	4.01	0.02^	0.02^
VAS w-13	1.13	1.14	8.15	8.59	2.23	1.87
VAS w-14	1.31	1.37	4.53	4.17	0.04	0.03
VAS w-16a	0.46	0.52	3.07	3.83	3.37	4.57
VAS w-17	0.42	0.51	4.36	3.88	2.28	1.73
VAS w-20	0.59	0.62	4.4	3.52	4.19	2.99
VAS w-21	4.04	3.91	4.46	3.76	0.02^	0.02^

Avg Conc. = Average Concentration of the previous sampling events (typically 10 results per location)

Units: µg/L = micrograms per liter and mg/L = milligrams per liter.

^ refers to a concentration that is below the detection limit for this parameter

* = these locations had a sample replicate taken during this sampling event.

Table 13. Water quality sampling results for long-term monitoring sites within the Quartermaster Harbor Nitrogen Management Study Area. These additional parameters were analyzed at the same time at the Environmental Indicator s. Sampling occurred at 16 sites on September 15-16th2009.

Parameters	w-06	w-07	w-12	w-13
Alkalinity, Total	50.3	134.0	135.0	72.2
Ammonia As N	0.005^	0.384	0.192	0.005^
Nitrogen, Total	1.35	0.41	0.19	2.28
Phosphorus, Total	0.027	0.314	0.180	0.023
Phosphorus, Ortho	0.026	0.273	0.146	0.023
Silica	28.7	42.1	29.1	33.9
Total Suspended Solids	0.5^	1.2	4.42	0.5^

Units are mg/L = milligrams per liter for all parameters.

^ refers to a concentration that is below the detection limit for this parameter

Table 14. Water Quality sampling results for the monitoring well sites. This sampling occurred shortly after the long-term monitoring event, September 17 - 21st 2009.

Parameters	W-61	W-65	W-70*		W-71	W-72	W-73	Units
Total Alkalinity	76.1	76.3	145.0	145.0	72.3	124.0	75.8	mg/L
Total Dissolved Solids	159	157	232	234	140	204	156	
Total Suspended Solids	2.4	1.6	3.3	3.3	0.5^	4.2	6.2	
Chloride	7.2	7.3	11.5	11.5	3.1	13.1	5.1	
Fluoride	0.04	0.07	0.20	0.20	0.05	0.03	0.07	
Sulfate	19.0	16.4	17.0	16.7	21.2	11.4	14.3	
Total Nitrogen	0.05^	0.05^	1.34	1.39	0.05	0.79	0.05	
Nitrite + Nitrate Nitrogen	0.01^	0.01^	0.01^	0.01^	0.01^	0.78	0.01^	
Total Phosphorus	0.053	0.054	0.378	0.388	0.039	0.035	0.105	
Orthophosphate Phosphorus	0.047	0.046	0.325	0.314	0.029	0.029	0.076	
Silica	43.2	44.6	31.8	31.5	36.2	40.3	42.1	
Antimony, Total	0.3^	0.3^	0.3^	0.3^	0.3^	0.3^	0.3^	ug/L
Arsenic, Total	1.4	1.5	11.7	11.0	1.7	1.4	3.2	
Beryllium, Total	0.1^	0.1^	0.1^	0.1^	0.1^	0.1^	0.1^	
Cadmium, Total	0.05^	0.05^	0.05^	0.05^	0.05^	0.05^	0.05^	
Calcium, Total	15000	14100	9190	9190	8880	18600	15300	
Chromium, Total	0.37	0.27	0.80	0.61	0.20	1.66	0.53	
Copper, Total	0.40	2.00	0.97	0.71	0.40	0.53	0.67	
Iron, Total	97.9	2050	299	218	1270	127	1190	
Lead, Total	0.1^	0.1^	0.2	0.1	0.1^	0.1^	0.1^	
Magnesium, Total	10500	10100	3320	3350	13300	18900	9690	
Nickel, Total	0.553	0.4	0.944	0.683	0.739	3.21	1.42	
Potassium, Total	2060	1960	7450	7310	1550	2150	1850	
Selenium, Total	0.5^	0.5^	0.5^	0.5^	0.5^	0.5^	0.5^	
Silver, Total	0.05^	0.05^	0.05^	0.05^	0.05^	0.05^	0.05^	
Sodium, Total	5590	5170	52400	56100	5480	7860	5420	
Thallium, Total	0.04^	0.04^	0.04^	0.04^	0.04^	0.04^	0.04^	
Zinc, Total	1.2	1.8	1.5	1.1	2.5	1.1	0.6	
Hardness, Calc	80.7	76.8	36.6	36.7	76.9	124.0	78.0	mg/L

^ refers to a concentration that is below the detection limit for this parameter

* = these locations had a sample replicate taken during this sampling event.

Table 15. Average Daily usage of permit exempt wells shown as gallons per day. Values are calculated of the difference of meter readings divided by the number of days between readings. Data collection started in April 2007. Average daily usage of these sites are plotted versus time in Figure 25.

Site Id	Water Year 2009											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
VMI-ex01	374	92	69	83	77	68	95	106	—	622	907	401
VMI-ex02	180	123	128	121	119	129	133	285	133	160	186	179
VMI-ex03	29	40	—	27	29	33	37	—	62	46	44	45
VMI-ex04	172	—	—	—	—	—	85	—	185	353	734	—
VMI-ex05	175	215	—	169	161	161	—	—	—	361	—	—
VMI-ex06	—	—	—	—	—	—	75	—	—	—	—	212
VMI-ex07	—	—	—	—	—	—	87	—	—	105	—	—
VMI-ex08	—	—	—	—	—	—	—	—	—	—	—	—

Site Id	Water Year 2008											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
VMI-ex01	91	—	298	99	87	90	95	158	—	497	—	705
VMI-ex02	78	89	96	104	94	93	161	144	143	116	141	129
VMI-ex03	26	31	41	60	37	27	53	28	28	49	29	35
VMI-ex04	127	107	87	78	70	82	94	101	107	220	185	236
VMI-ex05	369	172	307	248	250	158	188	190	353	610	405	309
VMI-ex06	—	—	—	59	—	—	—	0	—	92	—	—
VMI-ex07	—	—	—	104	—	—	—	94	—	112	—	—
VMI-ex08	—	—	—	—	—	—	—	—	—	—	—	—

Site Id	Water Year 2007					
	Apr	May	Jun	Jul	Aug	Sep
VMI-ex01	NC	94	456	436	816	357
VMI-ex02	88	96	114	118	104	105
VMI-ex03	45	40	34	18	43	31
VMI-ex04	NC	NC	125	632	717	345
VMI-ex05	70	261	523	522	442	549
VMI-ex06	NC	NC	NC	91	170	319
VMI-ex07	NC	NC	142	—	109	—
VMI-ex08	NC	NC	—	548	—	—

Units for results are shown are gallons per day.

NC = Not connected – meter not installed that month.

“—” refers to a calendar month that no readings were reported.

Appendix A

Precipitation data

43U North Vashon**Water Year 2009**

01Oct08 to 30Sep09

Rainfall in inches

Data are provisional until end of year

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.14	0.18	0.91	0.00	0.46	0.38	0.00	0.00	0.00	0.00	0.02
2	0.07	0.34	0.02	0.23	0.00	0.26	0.71	0.53	0.00	0.00	0.00	0.00
3	0.75	0.52	0.00	0.01	0.00	0.19	0.06	0.04	0.00	0.00	0.00	0.10
4	0.14	0.81	0.00	0.01	0.00	0.02	0.00	0.55	0.00	0.00	0.00	0.00
5	0.03	0.00	0.00	0.82	0.00	0.02	0.00	1.27	0.00	0.00	0.00	0.51
6	0.53	2.40	0.00	0.65	0.06	0.00	0.00	0.80	0.02	0.00	0.00	1.00
7	0.01	1.27	0.01	2.50	0.00	0.17	0.00	0.01	0.00	0.00	0.00	0.02
8	0.00	0.31	0.00	0.32	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00
9	0.03	0.10	0.08	0.00	0.02	0.11	0.00	0.00	0.00	0.00	0.00	0.01
10	0.00	0.00	0.04	0.11	0.32	0.00	0.05	0.00	0.00	0.00	0.04	0.00
11	0.00	0.60	0.00	0.06	0.21	0.00	0.06	0.07	0.00	0.00	0.28	0.00
12	0.00	0.86	0.82	0.07	0.00	0.00	1.20	0.03	0.00	0.08	0.06	0.00
13	0.07	0.00	0.14	0.01	0.00	0.00	0.23	0.71	0.00	0.03	0.33	0.00
14	0.01	0.00	0.00	0.00	0.00	0.79	0.01	0.32	0.00	0.00	0.01	0.00
15	0.12	0.00	0.14	0.00	0.03	0.63	0.00	0.00	0.00	0.00	0.00	0.00
16	0.04	0.00	0.08	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00	0.05
17	0.12	0.01	0.07	0.00	0.00	0.30	0.29	0.00	0.00	0.00	0.00	0.01
18	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.01	0.00	0.06	0.00	0.08	0.13	0.00	0.00	0.47
20	0.23	0.24	0.00	0.01	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00
21	0.01	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00
22	0.00	0.01	0.00	0.00	0.15	0.01	0.28	0.00	0.02	0.00	0.00	0.00
23	0.01	0.00	0.00	0.00	0.24	0.13	0.03	0.00	0.00	0.00	0.00	0.00
24	0.01	0.00	0.00	0.07	0.45	0.01	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.02	1.00	0.09	0.40	0.03	0.00	0.00	0.08	0.00	0.02	0.00
26	0.00	0.00	0.42	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.15	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.01	0.30	0.00	0.00	0.47	0.20	0.00	0.00	0.00	0.05	0.00
29	0.00	0.00	0.28	0.00		0.04	0.00	0.00	0.00	0.00	0.26	0.08
30	0.00	0.04	0.11	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.01
31	0.41		0.12	0.01		0.00		0.00		0.00	0.00	
Total	2.59	7.92	3.96	6.01	1.98	4.34	3.50	4.90	0.38	0.11	1.05	2.28

Year To Date Total: 39.02 inches

s = snow

e = estimated

Precipitation is measured with a tipping bucket rain gauge.

Ice and snow accumulations in the rain gage are not recorded until they melt.

Precipitation from snow is not measured accurately

King County Water and Land Resources Division (206) 296-6519

Download streamflow and rainfall data from the
Hydrologic Information Center at the King County
Department of Natural Resources website:
<http://dnr.metrokc.gov/hydrodat>

28Y Judd Creek - transfer Station**Water Year 2009** 01Oct08 to 30Sep09

Rainfall in inches

Data are provisional until end of year

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.13	0.18	0.84	0.00	0.39	0.45	0.00	0.00	0.00	0.00	0.00
2	0.08	0.40	0.02	0.25	0.00	0.20	0.77	0.56	0.00	0.00	0.00	0.00
3	0.65	0.51	0.00	0.01	0.00	0.18	0.03	0.03	0.00	0.00	0.00	0.07
4	0.15	0.63	0.00	0.01	0.00	0.02	0.00	0.56	0.00	0.00	0.00	0.00
5	0.03	0.00	0.00	0.75	0.00	0.03	0.00	1.19	0.00	0.00	0.00	0.37
6	0.44	2.39	0.00	0.93	0.04	0.00	0.00	0.82	0.09	0.01	0.00	0.98
7	0.01	1.56	0.05	2.83	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.01
8	0.00	0.22	0.00	0.29	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01
9	0.11	0.09	0.09	0.00	0.02	0.11	0.02	0.00	0.00	0.00	0.00	0.01
10	0.01	0.00	0.03	0.12	0.15	0.01	0.03	0.00	0.00	0.00	0.00	0.00
11	0.00	0.62	0.00	0.03	0.30	0.00	0.05	0.08	0.00	0.00	0.23	0.00
12	0.00	0.96	0.76	0.09	0.00	0.00	1.13	0.02	0.00	0.06	0.06	0.00
13	0.03	0.00	0.16	0.01	0.00	0.00	0.25	0.67	0.00	0.03	0.19	0.00
14	0.01	0.00	0.00	0.00	0.00	0.51	0.00	0.24	0.00	0.00	0.01	0.00
15	0.12	0.00	0.00	0.00	0.03	0.65	0.00	0.00	0.00	0.00	0.00	0.00
16	0.05	0.00	0.05	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.03
17	0.15	0.01	0.03	0.00	0.00	0.26	0.30	0.00	0.00	0.00	0.00	0.00
18	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.41	0.00	0.00	0.00	0.00
19	0.00	0.00	0.04	0.01	0.00	0.06	0.00	0.10	0.05	0.00	0.00	0.23
20	0.22	0.16	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.13	0.01	0.21	0.00	0.02	0.00	0.00	0.00
23	0.02	0.00	0.00	0.00	0.21	0.16	0.04	0.00	0.00	0.01	0.00	0.00
24	0.00	0.00	0.84	0.07	0.45	0.01	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.02	0.07	0.06	0.31	0.01	0.00	0.00	0.04	0.00	0.03	0.00
26	0.00	0.01	0.21	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.15	0.12	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.24	0.00	0.00	0.39	0.25	0.00	0.00	0.00	0.03	0.00
29	0.00	0.00	0.25	0.00		0.07	0.00	0.00	0.00	0.00	0.29	0.03
30	0.00	0.03	0.09	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.39		0.12	0.00		0.01		0.00		0.00	0.00	
Total	2.48	7.90	3.38	6.42	1.67	3.62	3.53	4.69	0.57	0.11	0.84	1.74

Year To Date Total: 36.95 inches

s = snow

e = estimated

Precipitation is measured with a tipping bucket rain gauge.

Ice and snow accumulations in the rain gage are not recorded until they melt.

Precipitation from snow is not measured accurately

Download streamflow and rainfall data from the
Hydrologic Information Center at the King County
Department of Natural Resources website:
<http://dnr.metrokc.gov/hydrodat>

King County Water and Land Resources Division (206) 296-6519

36U Maury Island**Water Year 2009**

01Oct08 to 30Sep09

Rainfall in inches

Data are provisional until end of year

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.12	0.15	0.87	0.00	0.36	0.43	0.00	0.00	0.00	0.00	0.00
2	0.07	0.37	0.02	0.21	0.00	0.14	0.52	0.42	0.00	0.00	0.00	0.00
3	0.57	0.46	0.00	0.01	0.00	0.16	0.02	0.00	0.00	0.00	0.00	0.09
4	0.12	0.57	0.00	0.21	0.00	0.05	0.01	0.39	0.00	0.00	0.00	0.00
5	0.01	0.00	0.00	0.58	0.00	0.11	0.00	0.75	0.00	0.00	0.00	0.53
6	0.54	2.33	0.00	0.95	0.04	0.00	0.00	0.85	0.00	0.00	0.00	0.98
7	0.03	1.33	0.04	2.51	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02
8	0.00	0.20	0.00	0.16	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.01
9	0.08	0.08	0.08	0.00	0.00	0.09	0.02	0.00	0.00	0.00	0.00	0.01
10	0.00	0.07	0.04	0.12	0.35	0.00	0.05	0.00	0.00	0.00	0.00	0.00
11	0.00	0.48	0.00	0.02	0.01	0.00	0.02	0.04	0.00	0.00	0.28	0.00
12	0.01	0.89	0.80	0.06	0.00	0.01	0.93	0.05	0.00	0.00	0.15	0.00
13	0.00	0.02	0.17	0.00	0.00	0.00	0.26	0.48	0.00	0.03	0.20	0.00
14	0.00	0.00	0.01	0.00	0.00	0.46	0.00	0.29	0.00	0.00	0.00	0.00
15	0.09	0.00	0.00	0.00	0.05	0.77	0.00	0.00	0.00	0.00	0.00	0.00
16	0.06	0.00	0.01	0.00	0.01	0.30	0.00	0.00	0.00	0.00	0.00	0.01
17	0.18	0.01	0.08	0.00	0.00	0.22	0.28	0.00	0.00	0.00	0.00	0.00
18	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.35	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.01	0.00	0.08	0.00	0.04	0.08	0.00	0.00	0.22
20	0.25	0.11	0.00	0.00	0.01	0.14	0.00	0.01	0.01	0.00	0.00	0.00
21	0.01	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00
22	0.00	0.00	0.37	0.00	0.12	0.03	0.21	0.00	0.02	0.00	0.00	0.00
23	0.07	0.00	0.07	0.00	0.20	0.12	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	1.06	0.06	0.26	0.01	0.01	0.00	0.00	0.00	0.00	0.00
25	0.00	0.04	0.16	0.05	0.26	0.02	0.00	0.00	0.00	0.00	0.02	0.00
26	0.00	0.00	0.16	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.16	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.01	0.29	0.00	0.00	0.33	0.28	0.00	0.00	0.00	0.03	0.00
29	0.00	0.00	0.36	0.00		0.04	0.00	0.00	0.00	0.00	0.32	0.01
30	0.01	0.03	0.09	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.38		0.09	0.00		0.02		0.00		0.00	0.00	
Total	2.48	7.21	4.21	5.94	1.34	3.53	3.04	3.69	0.74	0.03	1.00	1.88

Year To Date Total:**35.09 inches**

s = snow

e = estimated

Precipitation is measured with a tipping bucket rain gauge.

Ice and snow accumulations in the rain gage are not recorded until they melt.

Precipitation from snow is not measured accurately

Download streamflow and rainfall data from the
Hydrologic Information Center at the King County
Department of Natural Resources website:
<http://dnr.metrokc.gov/hydrodat>

King County Water and Land Resources Division (206) 296-6519

36V East Maury Is.**Water Year 2009**

01Oct08 to 30Sep09

Rainfall in inches

Data are provisional until end of year

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.14	0.00	0.66	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.00
2	0.05	0.33	0.01	0.18	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00
3	0.58	0.35	0.01	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
4	0.09	0.59	0.00	0.28	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
5	0.01	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.41	2.29	0.00	0.88	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
7	0.03	1.33	0.07	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.20	0.00	0.41	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.05	0.10	0.06	0.08	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.04	0.04	0.03	0.26	0.39	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.36	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	1.09	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.01	0.00	0.17	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.10	0.00	0.00	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.22	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.01	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.18	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.01	0.02	0.03	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.10	0.00	0.04	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.64	0.01	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.01	0.11	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.02	0.08	0.21	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.01	0.18	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.01	0.22	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.01	0.05	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.38		0.06	0.00		0.00		0.00		0.00	0.00	
Total	2.32	7.11	3.06	4.45	1.28	0.85	0.00	0.00	0.00	0.00	0.00	0.00

Year To Date Total: 19.07 inches

s = snow

e = estimated

Precipitation is measured with a tipping bucket rain gauge.

Ice and snow accumulations in the rain gage are not recorded until they melt.

Precipitation from snow is not measured accurately

King County Water and Land Resources Division (206) 296-6519

Download streamflow and rainfall data from the
Hydrologic Information Center at the King County
Department of Natural Resources website:
<http://dnr.metrokc.gov/hydrodat>

65U South Vashon - Tahlequah**Water Year 2009** 01Oct08 to 30Sep09

Rainfall in inches

Data are provisional until end of year

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.10	0.17	0.77	0.00	0.35	0.47	0.00	0.00	0.00	0.00	0.00
2	0.09	0.36	0.03	0.24	0.00	0.17	0.49	0.44	0.00	0.00	0.00	0.00
3	0.67	0.47	0.00	0.02	0.00	0.15	0.02	0.01	0.00	0.00	0.00	0.07
4	0.18	0.74	0.00	0.01	0.00	0.04	0.00	0.56	0.00	0.00	0.00	0.00
5	0.03	0.00	0.00	0.82	0.00	0.21	0.00	0.82	0.00	0.00	0.00	0.61
6	0.67	2.31	0.00	1.33	0.05	0.00	0.00	0.99	0.08	0.00	0.00	0.85
7	0.05	1.59	0.22	3.17	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.09
8	0.00	0.23	0.01	0.25	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.02
9	0.19	0.10	0.06	0.00	0.00	0.10	0.02	0.00	0.00	0.00	0.00	0.00
10	0.00	0.06	0.05	0.14	0.04	0.03	0.04	0.01	0.00	0.00	0.01	0.00
11	0.00	0.66	0.00	0.04	0.35	0.00	0.07	0.09	0.00	0.00	0.28	0.00
12	0.00	1.06	0.36	0.11	0.00	0.00	1.14	0.18	0.00	0.02	0.16	0.00
13	0.01	0.00	0.19	0.00	0.00	0.00	0.37	0.56	0.00	0.02	0.36	0.00
14	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.35	0.00	0.00	0.01	0.00
15	0.10	0.00	0.00	0.00	0.08	0.85	0.01	0.00	0.00	0.00	0.00	0.00
16	0.05	0.00	0.03	0.00	0.01	0.40	0.00	0.00	0.00	0.00	0.00	0.01
17	0.17	0.01	0.17	0.00	0.00	0.26	0.28	0.00	0.00	0.00	0.00	0.00
18	0.01	0.04	0.00	0.01	0.00	0.01	0.00	0.40	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.02	0.06	0.00	0.00	0.31
20	0.26	0.13	0.00	0.01	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.12	0.03	0.10	0.00	0.01	0.00	0.00	0.00
23	0.03	0.00	0.00	0.00	0.18	0.20	0.04	0.00	0.00	0.01	0.00	0.00
24	0.00	0.00	0.84	0.06	0.28	0.03	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.03	0.51	0.07	0.31	0.07	0.00	0.00	0.01	0.00	0.06	0.00
26	0.00	0.01	0.19	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.01	0.23	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.01	0.28	0.00	0.01	0.48	0.81	0.00	0.00	0.00	0.03	0.01
29	0.00	0.00	0.31	0.00		0.03	0.00	0.00	0.00	0.00	0.31	0.02
30	0.01	0.02	0.09	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.43		0.14	0.00		0.05		0.00		0.00	0.00	
Total	2.95	8.02	3.88	7.29	1.49	4.32	3.86	4.49	0.49	0.05	1.22	1.99

Year To Date Total: 40.05 inches

s = snow

e = estimated

Precipitation is measured with a tipping bucket rain gauge.

Ice and snow accumulations in the rain gage are not recorded until they melt.

Precipitation from snow is not measured accurately

King County Water and Land Resources Division (206) 296-6519

Download streamflow and rainfall data from the
Hydrologic Information Center at the King County
Department of Natural Resources website:
<http://dnr.metrokc.gov/hydrodat>

Appendix B

Water Quality Data

Appendix B-1

Stream Water Quality Data

King County Environmental Lab Analytical Report

PROJECT: 421195DC

Locator: VA12A
 Descrip: SHINGLEMILL CREEK
 Sampled: 10/07/08 10:05:00 AM
 Lab ID: L46550-1
 Matrix: FRESH WTR

Locator: VA41A
 Descrip: FISHER CREEK UPSTR
 Sampled: 10/07/08 10:44:00 AM
 Lab ID: L46550-2
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
-Wet Weight Basis						-Wet Weight Basis				
COMBINED LABS										
M=CV SM2130-B (311V4)										
Turbidity	0.925		0.2	0.5	NTU	1.35		0.2	0.5	NTU
M=CV SM2320-B (319V4)										
Total Alkalinity	76.3		1	5	mg CaCO3/L	55		1	5	mg CaCO3/L
M=CV SM2540-D (309V3)										
Total Suspended Solids	3.8		0.5	1	mg/L	9.25		0.9	1.9	mg/L
M=CV SM4500-N-C (331V3)C										
Total Nitrogen	0.931		0.05	0.1	mg/L	1.25		0.05	0.1	mg/L
M=CV SM4500-NH3-G (330V4)										
Ammonia Nitrogen	0.012	<RDL	0.01	0.02	mg/L	0.012	<RDL	0.01	0.02	mg/L
M=CV SM4500-NO3-F (330V4)										
Nitrite + Nitrate Nitrogen	0.757		0.02	0.04	mg/L	0.879		0.02	0.04	mg/L
M=CV SM4500-P-B,F(331V3)C										
Total Phosphorus	0.0635		0.005	0.01	mg/L	0.0764		0.005	0.01	mg/L
M=CV SM4500-P-F (330V4)										
Orthophosphate Phosphorus	0.0451		0.002	0.005	mg/L	0.0428		0.002	0.005	mg/L
M=ES HYDROLAB (SOP 205V4)										
Conductivity, Field	194		0.5	10	umhos/cm	162		0.5	10	umhos/cm
Dissolved Oxygen, Field	10.9		0.5	1	mg/L	10.5		0.5	1	mg/L
pH, Field	7.69				pH	7.63				pH
Sample Temperature, Field	10.55				deg C	11.31				deg C
M=ES NONE										
Field Personnel	SH				none	SH				none
Sampling Method	11011, 60201, 18100, 80011				none	11011, 60201, 18100				none
Staff Height	3.1	E,TA			ft					
Storm Or Non-Storm	N				none	N				none
M=MC SM 9213D 20TH (SOP 522V0)										
Escherichia coli	23				CFU/100ml	310				CFU/100ml
M=MC SM 9222D 20TH (SOP 506V1)										
Fecal Coliform	12				CFU/100ml	350				CFU/100ml

King County Environmental Lab Analytical Report

PROJECT: 421195DC

Locator: VA42A
 Descrip: JUDD CREEK AT SW 2
 Sampled: 10/07/08 11:16:00 AM
 Lab ID: L46550-3
 Matrix: FRESH WTR

Locator: VA45A
 Descrip: MILETA CREEK DOWNS
 Sampled: 10/07/08 11:42:00 AM
 Lab ID: L46550-4
 Matrix: FRESH WTR

Locator: VA65A
 Descrip: GORSUCH CREEK NEAR
 Sampled: 10/07/08 12:06:00 PM
 Lab ID: L46550-5
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
			-Wet Weight Basis					-Wet Weight Basis					-Wet Weight Basis		
COMBINED LABS															
M=CV SM2130-B (311V4)															
Turbidity	2.21		0.2	0.5	NTU	1.76		0.2	0.5	NTU	1.38		0.2	0.5	NTU
M=CV SM2320-B (319V4)															
Total Alkalinity	57.4		1	5	mg CaCO3/L	28.9		1	5	mg CaCO3/L	71.6		1	5	mg CaCO3/L
M=CV SM2540-D (309V3)															
Total Suspended Solids	7.2		0.5	1	mg/L	1.3		0.5	1	mg/L	34.3		0.5	1	mg/L
M=CV SM4500-N-C (331V3)C															
Total Nitrogen	1.18		0.05	0.1	mg/L	0.866		0.05	0.1	mg/L	1.58		0.05	0.1	mg/L
M=CV SM4500-NH3-G (330V4)															
Ammonia Nitrogen	<MDL		0.01	0.02	mg/L	<MDL		0.01	0.02	mg/L	<MDL		0.01	0.02	mg/L
M=CV SM4500-NO3-F (330V4)															
Nitrite + Nitrate Nitrogen	0.644		0.02	0.04	mg/L	0.454		0.02	0.04	mg/L	1.23		0.02	0.04	mg/L
M=CV SM4500-P-B,F(331V3)C															
Total Phosphorus	0.0621		0.005	0.01	mg/L	0.0308		0.005	0.01	mg/L	0.0813		0.005	0.01	mg/L
M=CV SM4500-P-F (330V4)															
Orthophosphate Phosphorus	0.0298		0.002	0.005	mg/L	0.0116		0.002	0.005	mg/L	0.0512		0.002	0.005	mg/L
M=ES HYDROLAB (SOP 205V4)															
Conductivity, Field	159		0.5	10	umhos/cm	136		0.5	10	umhos/cm	187		0.5	10	umhos/cm
Dissolved Oxygen, Field	10.4		0.5	1	mg/L	8.3		0.5	1	mg/L	9.7		0.5	1	mg/L
pH, Field	7.77				pH	7.08				pH	7.76				pH
Sample Temperature, Field	11.41				deg C	11.81				deg C	11.82				deg C
M=ES NONE															
Field Personnel	SH				none	SH				none	SH				none
Sampling Method	11011, 60201, 18100, 80011				none	11011, 60201, 18100				none	11011, 60201, 18100				none
Staff Height	0.72				ft										
Storm Or Non-Storm	N				none	N				none	N				none
M=MC SM 9213D 20TH (SOP 522V0)															
Escherichia coli	270				CFU/100ml	20				CFU/100ml	63				CFU/100ml
M=MC SM 9222D 20TH (SOP 506V1)															
Fecal Coliform	120				CFU/100ml	26				CFU/100ml	30				CFU/100ml

King County Environmental Lab Analytical Report

PROJECT: 421195DC

Locator: VA12A
 Descrip: SHINGLEMILL CREEK
 Sampled: 11/04/08 9:08:00 AM
 Lab ID: L46861-1
 Matrix: FRESH WTR

Locator: VA41A
 Descrip: FISHER CREEK UPSTR
 Sampled: 11/04/08 7:36:00 AM
 Lab ID: L46861-2
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
-Wet Weight Basis						-Wet Weight Basis				
COMBINED LABS										
M=CV SM2130-B (311V4)										
Turbidity	5.93		0.2	0.5	NTU	52		0.2	0.5	NTU
M=CV SM2320-B (319V4)										
Total Alkalinity	64.4		1	5	mg CaCO3/L	38		1	5	mg CaCO3/L
M=CV SM2540-D (309V3)										
Total Suspended Solids	21		0.5	1	mg/L	284		2.5	5	mg/L
M=CV SM4500-N-C (331V3)C										
Total Nitrogen	1.67		0.05	0.1	mg/L	3.35		0.05	0.1	mg/L
M=CV SM4500-NH3-G (330V4)										
Ammonia Nitrogen	0.012	<RDL	0.01	0.02	mg/L	<MDL		0.01	0.02	mg/L
M=CV SM4500-NO3-F (330V4)										
Nitrite + Nitrate Nitrogen	1.15		0.06	0.12	mg/L	1.57		0.02	0.04	mg/L
M=CV SM4500-P-B,F(331V3)C										
Total Phosphorus	0.0835		0.005	0.01	mg/L	0.343		0.005	0.01	mg/L
M=CV SM4500-P-F (330V4)										
Orthophosphate Phosphorus	0.0438		0.002	0.005	mg/L	0.0336		0.002	0.005	mg/L
M=ES HYDROLAB (SOP 205V4)										
Conductivity, Field	171		0.5	10	umhos/cm	136		0.5	10	umhos/cm
Dissolved Oxygen, Field	10.5		0.5	1	mg/L	10.3		0.5	1	mg/L
pH, Field	7.57				pH	7.33				pH
Sample Temperature, Field	8.66				deg C	8.96				deg C
M=ES NONE										
Field Personnel	DR				none	DR				none
Sampling Method	11011, 60201, 18100				none	11011, 60201, 18100				none
Staff Height	below staff plate				ft					
Storm Or Non-Storm	N				none	N				none
M=MC SM 9213D 20TH (SOP 522V0)										
Escherichia coli	82				CFU/100ml	1500				CFU/100ml
M=MC SM 9222D 20TH (SOP 506V1)										
Fecal Coliform	83				CFU/100ml	870				CFU/100ml

King County Environmental Lab Analytical Report

PROJECT: 421195DC

Locator: VA42A
 Descrip: JUDD CREEK AT SW 2
 Sampled: 11/04/08 7:56:00 AM
 Lab ID: L46861-3
 Matrix: FRESH WTR

Locator: VA45A
 Descrip: MILETA CREEK DOWNS
 Sampled: 11/04/08 8:18:00 AM
 Lab ID: L46861-4
 Matrix: FRESH WTR

Locator: VA65A
 Descrip: GORSUCH CREEK NEAR
 Sampled: 11/04/08 8:49:00 AM
 Lab ID: L46861-5
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
			-Wet Weight Basis					-Wet Weight Basis					-Wet Weight Basis		
COMBINED LABS															
M=CV SM2130-B (311V4)															
Turbidity	20.9		0.2	0.5	NTU	6.08		0.2	0.5	NTU	24.5		0.2	0.5	NTU
M=CV SM2320-B (319V4)															
Total Alkalinity	43.8		1	5	mg CaCO3/L	23.7		1	5	mg CaCO3/L	35.6		1	5	mg CaCO3/L
M=CV SM2540-D (309V3)															
Total Suspended Solids	316		3.3	6.7	mg/L	3.8		0.5	1	mg/L	122		1.6	3.2	mg/L
M=CV SM4500-N-C (331V3)C															
Total Nitrogen	2.88		0.05	0.1	mg/L	1.04		0.05	0.1	mg/L	1.5		0.05	0.1	mg/L
M=CV SM4500-NH3-G (330V4)															
Ammonia Nitrogen	<MDL		0.01	0.02	mg/L	<MDL		0.01	0.02	mg/L	<MDL		0.01	0.02	mg/L
M=CV SM4500-NO3-F (330V4)															
Nitrite + Nitrate Nitrogen	0.771		0.02	0.04	mg/L	0.438		0.02	0.04	mg/L	0.846		0.02	0.04	mg/L
M=CV SM4500-P-B,F(331V3)C															
Total Phosphorus	0.325		0.005	0.01	mg/L	0.0401		0.005	0.01	mg/L	0.189		0.005	0.01	mg/L
M=CV SM4500-P-F (330V4)															
Orthophosphate Phosphorus	0.021		0.002	0.005	mg/L	0.00873		0.002	0.005	mg/L	0.0321		0.002	0.005	mg/L
M=ES HYDROLAB (SOP 205V4)															
Conductivity, Field	133		0.5	10	umhos/cm	127		0.5	10	umhos/cm	68.4		0.5	10	umhos/cm
Dissolved Oxygen, Field	10.5		0.5	1	mg/L	9.4		0.5	1	mg/L	10.7		0.5	1	mg/L
pH, Field	7.51				pH	7.06				pH	7.39				pH
Sample Temperature, Field	8.83				deg C	9.19				deg C	8.56				deg C
M=ES NONE															
Field Personnel	DR				none	DR				none	DR				none
Sampling Method	11011, 60201, 18100, 80011				none	11011, 60201, 18100				none	11011, 60201, 18100				none
Staff Height	1.02				ft										
Storm Or Non-Storm	N				none	N				none	N				none
M=MC SM 9213D 20TH (SOP 522V0)															
Escherichia coli	1300				CFU/100ml	52				CFU/100ml	1600				CFU/100ml
M=MC SM 9222D 20TH (SOP 506V1)															
Fecal Coliform	2800				CFU/100ml	94				CFU/100ml	2700				CFU/100ml

King County Environmental Lab Analytical Report

PROJECT: 421195DC	Locator: VA12A					Locator: VA41A					
	Descrip: SHINGLEMILL CREEK					Descrip: FISHER CREEK UPSTR					
	Sampled: 12/02/08 9:42:00 AM					Sampled: 12/02/08 11:38:00 AM					
	Lab ID: L47017-1					Lab ID: L47017-2					
	Matrix: FRESH WTR					Matrix: FRESH WTR					
Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	
			-Wet Weight Basis					-Wet Weight Basis			
COMBINED LABS											
M=CV SM2130-B (311V4)											
Turbidity	0.772		0.2	0.5	NTU	0.867		0.2	0.5	NTU	
M=CV SM2320-B (319V4)											
Total Alkalinity	72.1		1	5	mg CaCO3/L	55.9		1	5	mg CaCO3/L	
M=CV SM2540-D (309V3)											
Total Suspended Solids	2.8		0.5	1	mg/L	2.8		0.5	1	mg/L	
M=CV SM4500-N-C (331V3)C											
Total Nitrogen	0.97		0.05	0.1	mg/L	1.04		0.05	0.1	mg/L	
M=CV SM4500-NH3-G (330V4)											
Ammonia Nitrogen	0.0268		0.01	0.02	mg/L	0.01	<RDL	0.01	0.02	mg/L	
M=CV SM4500-NO3-F (330V4)											
Nitrite + Nitrate Nitrogen	0.782		0.02	0.04	mg/L	0.767		0.02	0.04	mg/L	
M=CV SM4500-P-B,F(331V3)C											
Total Phosphorus	0.0521		0.005	0.01	mg/L	0.0514		0.005	0.01	mg/L	
M=CV SM4500-P-F (330V4)											
Orthophosphate Phosphorus	0.0388		0.002	0.005	mg/L	0.0379		0.002	0.005	mg/L	
M=ES HYDROLAB (SOP 205V4)											
Conductivity, Field	182		0.5	10	umhos/cm	153		0.5	10	umhos/cm	
Dissolved Oxygen, Field	10.9		0.5	1	mg/L	10.5		0.5	1	mg/L	
pH, Field	7.62				pH	7.49				pH	
Sample Temperature, Field	9.19				deg C	9.74				deg C	
M=ES NONE											
Field Personnel	SH				none	SH				none	
Sampling Method	11011, 60201, 18100				none	11011, 60201, 18100				none	
Staff Height	below staff plate	TA			ft						
Storm Or Non-Storm	N				none	N				none	
M=MC SM 9213D 20TH (SOP 522V0)											
Escherichia coli	7				CFU/100ml	19				CFU/100ml	
M=MC SM 9222D 20TH (SOP 506V1)											
Fecal Coliform	7				CFU/100ml	14				CFU/100ml	

King County Environmental Lab Analytical Report

PROJECT: 421195DC

Locator: VA42A
 Descrip: JUDD CREEK AT SW 2
 Sampled: 12/02/08 10:40:00 AM
 Lab ID: L47017-3
 Matrix: FRESH WTR

Locator: VA45A
 Descrip: MILETA CREEK DOWNS
 Sampled: 12/02/08 12:16:00 PM
 Lab ID: L47017-4
 Matrix: FRESH WTR

Locator: VA65A
 Descrip: GORSUCH CREEK NEAR
 Sampled: 12/02/08 10:21:00 AM
 Lab ID: L47017-5
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units		
		-Wet Weight Basis						-Wet Weight Basis						-Wet Weight Basis			
COMBINED LABS																	
M=CV SM2130-B (311V4)																	
Turbidity	1.29		0.2	0.5	NTU	2.46		0.2	0.5	NTU	1.21		0.2	0.5	NTU		
M=CV SM2320-B (319V4)																	
Total Alkalinity	59		1	5	mg CaCO3/L	28.2		1	5	mg CaCO3/L	77.7		1	5	mg CaCO3/L		
M=CV SM2540-D (309V3)																	
Total Suspended Solids	1.7		0.5	1	mg/L	3.4		0.5	1	mg/L	1.3		0.5	1	mg/L		
M=CV SM4500-N-C (331V3)C																	
Total Nitrogen	1.01		0.05	0.1	mg/L	1.52		0.05	0.1	mg/L	1.27		0.05	0.1	mg/L		
M=CV SM4500-NH3-G (330V4)																	
Ammonia Nitrogen	0.012	<RDL	0.01	0.02	mg/L	<MDL	0.01	0.02		mg/L	<MDL	0.01	0.02		mg/L		
M=CV SM4500-NO3-F (330V4)																	
Nitrite + Nitrate Nitrogen	0.637		0.02	0.04	mg/L	1.11		0.02	0.04	mg/L	1.03		0.02	0.04	mg/L		
M=CV SM4500-P-B,F(331V3)C																	
Total Phosphorus	0.0424		0.005	0.01	mg/L	0.0192		0.005	0.01	mg/L	0.0512		0.005	0.01	mg/L		
M=CV SM4500-P-F (330V4)																	
Orthophosphate Phosphorus	0.0233		0.002	0.005	mg/L	0.0053		0.002	0.005	mg/L	0.0375		0.002	0.005	mg/L		
M=ES HYDROLAB (SOP 205V4)																	
Conductivity, Field	152		0.5	10	umhos/cm	115		0.5	10	umhos/cm	195		0.5	10	umhos/cm		
Dissolved Oxygen, Field	10.2		0.5	1	mg/L	8.2		0.5	1	mg/L	10.2		0.5	1	mg/L		
pH, Field	7.67				pH	6.84				pH	7.63				pH		
Sample Temperature, Field	9.49				deg C	9.81				deg C	9.28				deg C		
M=ES NONE																	
Field Personnel	SH				none	SH				none	SH				none		
Sampling Method	11011, 60201, 18100, 80011				none	11011, 60201, 18100				none	11011, 60201, 18100				none		
Staff Height	0.76				ft												
Storm Or Non-Storm	N				none	N				none	N				none		
M=MC SM 9213D 20TH (SOP 522V0)																	
Escherichia coli	29				CFU/100ml	3				CFU/100ml	4				CFU/100ml		
M=MC SM 9222D 20TH (SOP 506V1)																	
Fecal Coliform	23				CFU/100ml	5				CFU/100ml	2				CFU/100ml		

King County Environmental Lab Analytical Report

PROJECT: 421195DC

Locator: VA12A
 Descrip: SHINGLEMILL CREEK
 Sampled: 01/06/09 9:08:00 AM
 Lab ID: L47159-1
 Matrix: FRESH WTR

Locator: VA41A
 Descrip: FISHER CREEK UPSTR
 Sampled: 01/06/09 7:41:00 AM
 Lab ID: L47159-2
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
-Wet Weight Basis						-Wet Weight Basis				
COMBINED LABS										
M=CV KEROUEL & AMINOT 1997										
Ammonia Nitrogen	0.0061	<RDL	0.005	0.01	mg/L	0.0081	<RDL	0.005	0.01	mg/L
M=CV SM2130-B										
Turbidity	5.01		0.2	0.5	NTU	2.72		0.2	0.5	NTU
M=CV SM2320-B										
Total Alkalinity	21.6		1	5	mg CaCO3/L	31.7		1	5	mg CaCO3/L
M=CV SM2540-D										
Total Suspended Solids	19.2		0.5	1	mg/L	7.31		1	1.9	mg/L
M=CV SM4500-N-C										
Total Nitrogen	1.99		0.05	0.1	mg/L	2.47		0.05	0.1	mg/L
M=CV SM4500-NO3-F										
Nitrite + Nitrate Nitrogen	1.71		0.1	0.2	mg/L	2.19		0.1	0.2	mg/L
M=CV SM4500-P-B,F										
Total Phosphorus	0.0428		0.005	0.01	mg/L	0.0375		0.005	0.01	mg/L
M=CV SM4500-P-F										
Orthophosphate Phosphorus	0.0188		0.002	0.005	mg/L	0.0202		0.002	0.005	mg/L
M=ES HYDROLAB (SOP 205V4)										
Conductivity, Field	83.3		0.5	10	umhos/cm	112		0.5	10	umhos/cm
Dissolved Oxygen, Field	12.8		0.5	1	mg/L	11.8		0.5	1	mg/L
pH, Field	7.3				pH	7.26				pH
Sample Temperature, Field	4.61				deg C	5.48				deg C
M=ES NONE										
Field Personnel	DR				none	DR				none
Sampling Method	11011, 60201, 18100				none	11011, 60201, 18100				none
Staff Height										
Storm Or Non-Storm	N				none	N				none
M=MC SM 9213D 20TH (SOP 522V0)										
Escherichia coli	170				CFU/100ml	330				CFU/100ml
M=MC SM 9222D 20TH (SOP 506V1)										
Fecal Coliform	74	C			CFU/100ml	70				CFU/100ml

King County Environmental Lab Analytical Report

PROJECT: 421195DC

Locator: VA42A
 Descrip: JUDD CREEK AT SW 2
 Sampled: 01/06/09 8:03:00 AM
 Lab ID: L47159-3
 Matrix: FRESH WTR

Locator: VA45A
 Descrip: MILETA CREEK DOWNS
 Sampled: 01/06/09 8:21:00 AM
 Lab ID: L47159-4
 Matrix: FRESH WTR

Locator: VA65A
 Descrip: GORSUCH CREEK NEAR
 Sampled: 01/06/09 8:51:00 AM
 Lab ID: L47159-5
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
			-Wet Weight Basis					-Wet Weight Basis					-Wet Weight Basis		
COMBINED LABS															
M=CV KEROUEL & AMINOT 1997															
Ammonia Nitrogen	0.0079	<RDL	0.005	0.01	mg/L	<MDL	0.005	0.01		mg/L	<MDL	0.005	0.01		mg/L
M=CV SM2130-B															
Turbidity	4.09		0.2	0.5	NTU	4.38		0.2	0.5	NTU	15.9		0.2	0.5	NTU
M=CV SM2320-B															
Total Alkalinity	24.1		1	5	mg CaCO3/L	4.9	<RDL	1	5	mg CaCO3/L	24.3		1	5	mg CaCO3/L
M=CV SM2540-D															
Total Suspended Solids	7.1		0.5	1	mg/L	1.8		0.5	1	mg/L	30.4		0.7	1.4	mg/L
M=CV SM4500-N-C															
Total Nitrogen	2.01		0.05	0.1	mg/L	7.5		0.25	0.5	mg/L	1.98		0.05	0.1	mg/L
M=CV SM4500-NO3-F															
Nitrite + Nitrate Nitrogen	1.61		0.02	0.04	mg/L	7.21		0.1	0.2	mg/L	1.63		0.02	0.04	mg/L
M=CV SM4500-P-B,F															
Total Phosphorus	0.0341		0.005	0.01	mg/L	0.0113		0.005	0.01	mg/L	0.0517		0.005	0.01	mg/L
M=CV SM4500-P-F															
Orthophosphate Phosphorus	0.0108		0.002	0.005	mg/L	<MDL	0.002	0.005		mg/L	0.0116		0.002	0.005	mg/L
M=ES HYDROLAB (SOP 205V4)															
Conductivity, Field	85.2		0.5	10	umhos/cm	102		0.5	10	umhos/cm	92.7		0.5	10	umhos/cm
Dissolved Oxygen, Field	12.8		0.5	1	mg/L	12.2		0.5	1	mg/L	13.2		0.5	1	mg/L
pH, Field	7.26				pH	6.51				pH	7.4				pH
Sample Temperature, Field	4.53				deg C	5.85				deg C	4.8				deg C
M=ES NONE															
Field Personnel	DR				none	DR				none	DR				none
Sampling Method	11011, 60201, 18100, 80011				none	11011, 60201, 18100				none	11011, 60201, 18100				none
Staff Height	1.12				ft										
Storm Or Non-Storm	N				none	N				none	N				none
M=MC SM 9213D 20TH (SOP 522V0)															
Escherichia coli	70				CFU/100ml	25				CFU/100ml	100				CFU/100ml
M=MC SM 9222D 20TH (SOP 506V1)															
Fecal Coliform	56				CFU/100ml	16				CFU/100ml	91	C			CFU/100ml

King County Environmental Lab Analytical Report

PROJECT: 421195DC

Locator: VA12A
 Descrip: SHINGLEMILL CREEK
 Sampled: 02/03/09 9:59:17 AM
 Lab ID: L47319-1
 Matrix: FRESH WTR

Locator: VA41A
 Descrip: FISHER CREEK UPSTR
 Sampled: 02/03/09 8:45:16 AM
 Lab ID: L47319-2
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
-Wet Weight Basis						-Wet Weight Basis				
COMBINED LABS										
M=CV KEROUEL & AMINOT 1997										
Ammonia Nitrogen	0.0117		0.005	0.01	mg/L	0.0123		0.005	0.01	mg/L
M=CV SM2130-B										
Turbidity	1.95		0.2	0.5	NTU	1		0.2	0.5	NTU
M=CV SM2320-B										
Total Alkalinity	62.4		1	5	mg CaCO3/L	46.3		1	5	mg CaCO3/L
M=CV SM2540-D										
Total Suspended Solids	9.5		0.5	1	mg/L	3		1	2	mg/L
M=CV SM4500-N-C										
Total Nitrogen	1.06		0.05	0.1	mg/L	1.25		0.05	0.1	mg/L
M=CV SM4500-NO3-F										
Nitrite + Nitrate Nitrogen	0.97		0.02	0.04	mg/L	1.18		0.02	0.04	mg/L
M=CV SM4500-P-B,F										
Total Phosphorus	0.0407		0.005	0.01	mg/L	0.0347		0.005	0.01	mg/L
M=CV SM4500-P-F										
Orthophosphate Phosphorus	0.0308		0.002	0.005	mg/L	0.027		0.002	0.005	mg/L
M=ES HYDROLAB (SOP 205V4)										
Conductivity, Field	160		0.5	10	umhos/cm	133		0.5	10	umhos/cm
Dissolved Oxygen, Field	12.8		0.5	1	mg/L	12.6		0.5	1	mg/L
pH, Field	7.77				pH	7.52				pH
Sample Temperature, Field	4.22				deg C	3.66				deg C
M=ES NONE										
Field Personnel	DR				none	DR				none
Sampling Method	11011, 60201, 18100				none	11011, 60201, 18100				none
Staff Height	below staff plate	TA			ft					
Storm Or Non-Storm	N				none	N				none
M=MC SM 9213D 20TH (SOP 522V0)										
Escherichia coli	16				CFU/100ml	28				CFU/100ml
M=MC SM 9222D 20TH (SOP 506V1)										
Fecal Coliform	15				CFU/100ml	10				CFU/100ml

King County Environmental Lab Analytical Report

PROJECT: 421195DC

Locator: VA42A
 Descrip: JUDD CREEK AT SW 2
 Sampled: 02/03/09 9:08:38 AM
 Lab ID: L47319-3
 Matrix: FRESH WTR

Locator: VA45A
 Descrip: MILETA CREEK DOWNS
 Sampled: 02/03/09 9:25:02 AM
 Lab ID: L47319-4
 Matrix: FRESH WTR

Locator: VA65A
 Descrip: GORSUCH CREEK NEAR
 Sampled: 02/03/09 9:44:47 AM
 Lab ID: L47319-5
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
			-Wet Weight Basis					-Wet Weight Basis					-Wet Weight Basis		
COMBINED LABS															
M=CV KEROUEL & AMINOT 1997															
Ammonia Nitrogen	0.0134		0.005	0.01	mg/L	<MDL		0.005	0.01	mg/L	0.0077	<RDL	0.005	0.01	mg/L
M=CV SM2130-B															
Turbidity	1.09		0.2	0.5	NTU	3.1		0.2	0.5	NTU	1.34		0.2	0.5	NTU
M=CV SM2320-B															
Total Alkalinity	50.5		1	5	mg CaCO3/L	12.4		1	5	mg CaCO3/L	63.9		1	5	mg CaCO3/L
M=CV SM2540-D															
Total Suspended Solids	2.4		0.5	1	mg/L	<MDL		0.5	1	mg/L	2.1		0.5	1	mg/L
M=CV SM4500-N-C															
Total Nitrogen	1.22		0.05	0.1	mg/L	4.37		0.1	0.2	mg/L	1.5		0.05	0.1	mg/L
M=CV SM4500-NO3-F															
Nitrite + Nitrate Nitrogen	1.07		0.02	0.04	mg/L	4.3		0.04	0.08	mg/L	1.5		0.02	0.04	mg/L
M=CV SM4500-P-B,F															
Total Phosphorus	0.0247		0.005	0.01	mg/L	0.0101		0.005	0.01	mg/L	0.0317		0.005	0.01	mg/L
M=CV SM4500-P-F															
Orthophosphate Phosphorus	0.0169		0.002	0.005	mg/L	0.0037	<RDL	0.002	0.005	mg/L	0.0248		0.002	0.005	mg/L
M=ES HYDROLAB (SOP 205V4)															
Conductivity, Field	133		0.5	10	umhos/cm	97.7		0.5	10	umhos/cm	166		0.5	10	umhos/cm
Dissolved Oxygen, Field	13		0.5	1	mg/L	12		0.5	1	mg/L	not recorded	TA	0.5	1	mg/L
pH, Field	7.74				pH	6.75				pH	7.67				pH
Sample Temperature, Field	3.36				deg C	3.96				deg C	3.86				deg C
M=ES NONE															
Field Personnel	DR				none	DR				none	DR				none
Sampling Method	11011, 60201, 18100, 80011				none	11011, 60201, 18100				none	11011, 60201, 18100				none
Staff Height	0.71				ft										
Storm Or Non-Storm	N				none	N				none	N				none
M=MC SM 9213D 20TH (SOP 522V0)															
Escherichia coli	69				CFU/100ml	160				CFU/100ml	2				CFU/100ml
M=MC SM 9222D 20TH (SOP 506V1)															
Fecal Coliform	56				CFU/100ml	220				CFU/100ml	2				CFU/100ml

King County Environmental Lab Analytical Report

PROJECT: 421195DC

Locator: VA12A
 Descrip: SHINGLEMILL CREEK
 Sampled: 03/03/09 8:49:23 AM
 Lab ID: L47476-1
 Matrix: FRESH WTR

Locator: VA41A
 Descrip: FISHER CREEK UPSTR
 Sampled: 03/03/09 7:44:04 AM
 Lab ID: L47476-2
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
-Wet Weight Basis						-Wet Weight Basis				
COMBINED LABS										
M=CV KEROUEL & AMINOT 1997										
Ammonia Nitrogen	0.0121		0.005	0.01	mg/L	0.0133		0.005	0.01	mg/L
M=CV SM2130-B										
Turbidity	2.58		0.2	0.5	NTU	3.67		0.2	0.5	NTU
M=CV SM2320-B										
Total Alkalinity	42.3		1	5	mg CaCO3/L	50.1		1	5	mg CaCO3/L
M=CV SM2540-D										
Total Suspended Solids	12.2		0.5	1	mg/L	12.5		1	1.9	mg/L
M=CV SM4500-N-C										
Total Nitrogen	1.03		0.05	0.1	mg/L	1.33		0.05	0.1	mg/L
M=CV SM4500-NO3-F										
Nitrite + Nitrate Nitrogen	0.755		0.02	0.04	mg/L	1.01		0.04	0.08	mg/L
M=CV SM4500-P-B,F										
Total Phosphorus	0.0476		0.005	0.01	mg/L	0.061		0.005	0.01	mg/L
M=CV SM4500-P-F										
Orthophosphate Phosphorus	0.0228		0.002	0.005	mg/L	0.0294		0.004	0.01	mg/L
M=ES HYDROLAB (SOP 205V4)										
Conductivity, Field	112		0.5	10	umhos/cm	126		0.5	10	umhos/cm
Dissolved Oxygen, Field	13.4		0.5	1	mg/L	11.8		0.5	1	mg/L
pH, Field	7.55				pH	7.38				pH
Sample Temperature, Field	6.35				deg C	6.47				deg C
M=ES NONE										
Field Personnel	DR				none	DR				none
Sampling Method	11011, 60201, 18100				none	11011, 60201, 18100				none
Staff Height	below staff plate	TA			ft					
Storm Or Non-Storm	N				none	N				none
M=MC SM 9213D 20TH										
Escherichia coli	44				CFU/100ml	260				CFU/100ml
M=MC SM 9222D 20TH										
Fecal Coliform	36				CFU/100ml	130				CFU/100ml

King County Environmental Lab Analytical Report

PROJECT: 421195DC

Locator: VA42A
 Descrip: JUDD CREEK AT SW 2
 Sampled: 03/03/09 7:59:11 AM
 Lab ID: L47476-3
 Matrix: FRESH WTR

Locator: VA45A
 Descrip: MILETA CREEK DOWNS
 Sampled: 03/03/09 8:13:12 AM
 Lab ID: L47476-4
 Matrix: FRESH WTR

Locator: VA65A
 Descrip: GORSUCH CREEK NEAR
 Sampled: 03/03/09 8:33:11 AM
 Lab ID: L47476-5
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		-Wet Weight Basis					-Wet Weight Basis					-Wet Weight Basis			
COMBINED LABS															
M=CV KEROUEL & AMINOT 1997															
Ammonia Nitrogen	0.0123		0.005	0.01	mg/L	0.0075	<RDL	0.005	0.01	mg/L	0.0083	<RDL	0.005	0.01	mg/L
M=CV SM2130-B															
Turbidity	5.07		0.2	0.5	NTU	5.44		0.2	0.5	NTU	10		0.2	0.5	NTU
M=CV SM2320-B															
Total Alkalinity	45.3		1	5	mg CaCO3/L	12		1	5	mg CaCO3/L	36.5		1	5	mg CaCO3/L
M=CV SM2540-D															
Total Suspended Solids	9.4		0.5	1	mg/L	0.9	<RDL	0.5	1	mg/L	25.1		0.5	1	mg/L
M=CV SM4500-N-C															
Total Nitrogen	1.07		0.05	0.1	mg/L	4.55		0.1	0.2	mg/L	0.842		0.05	0.1	mg/L
M=CV SM4500-NO3-F															
Nitrite + Nitrate Nitrogen	0.731		0.02	0.04	mg/L	4.25		0.1	0.2	mg/L	0.626		0.02	0.04	mg/L
M=CV SM4500-P-B,F															
Total Phosphorus	0.0466		0.005	0.01	mg/L	0.0193		0.005	0.01	mg/L	0.0663		0.005	0.01	mg/L
M=CV SM4500-P-F															
Orthophosphate Phosphorus	0.0143		0.002	0.005	mg/L	<MDL		0.002	0.005	mg/L	0.0158		0.002	0.005	mg/L
M=ES HYDROLAB (SOP 205V4)															
Conductivity, Field	116		0.5	10	umhos/cm	95.8		0.5	10	umhos/cm	92.5		0.5	10	umhos/cm
Dissolved Oxygen, Field	12.3		0.5	1	mg/L	11.8		0.5	1	mg/L	11.7		0.5	1	mg/L
pH, Field	7.58				pH	6.74				pH	7.55				pH
Sample Temperature, Field	6.23				deg C	6.08				deg C	6.17				deg C
M=ES NONE															
Field Personnel	DR				none	DR				none	DR				none
Sampling Method	11011, 60201, 18100				none	11011, 60201, 18100				none	11011, 60201, 18100				none
Staff Height	0.8				ft										
Storm Or Non-Storm	N				none	N				none	N				none
M=MC SM 9213D 20TH															
Escherichia coli	220				CFU/100ml	150				CFU/100ml	130				CFU/100ml
M=MC SM 9222D 20TH															
Fecal Coliform	59				CFU/100ml	80				CFU/100ml	66				CFU/100ml

King County Environmental Lab Analytical Report

PROJECT: 421195-190

Locator: VA12A
 Descrip: SHINGLEMILL CREEK
 Sampled: 05/05/09 9:56:03 AM
 Lab ID: L47987-1
 Matrix: FRESH WTR

Locator: VA41A
 Descrip: FISHER CREEK UPSTR
 Sampled: 05/05/09 8:02:25 AM
 Lab ID: L47987-2
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
COMBINED LABS										
M=CV KEROUEL & AMINOT 1997										
Ammonia Nitrogen	0.0144		0.005	0.01	mg/L	0.0176		0.005	0.01	mg/L
M=CV SM2130-B										
Turbidity	23.4		0.2	0.5	NTU	24.9		0.2	0.5	NTU
M=CV SM2320-B										
Total Alkalinity	26.7		1	5	mg CaCO3/L	33.8		1	5	mg CaCO3/L
M=CV SM2540-D										
Total Suspended Solids	103		1.6	3.2	mg/L	88		2	4	mg/L
M=CV SM4500-N-C										
Total Nitrogen	1.16		0.05	0.1	mg/L	1.87		0.05	0.1	mg/L
M=CV SM4500-NO3-F										
Nitrite + Nitrate Nitrogen	0.431		0.01	0.04	mg/L	0.821		0.01	0.04	mg/L
M=CV SM4500-P-B,F										
Total Phosphorus	0.149		0.005	0.01	mg/L	0.186		0.005	0.01	mg/L
M=CV SM4500-P-F										
Orthophosphate Phosphorus	0.0223		0.002	0.005	mg/L	0.0295		0.002	0.005	mg/L
M=ES HYDROLAB										
Conductivity, Field	72.6		0.5	10	umhos/cm	98.6		0.5	10	umhos/cm
Dissolved Oxygen, Field	11.1		0.5	1	mg/L	10.2		0.5	1	mg/L
pH, Field	7.32				pH	7.13				pH
Sample Temperature, Field	9.59				deg C	9.41				deg C
M=ES NONE										
Field Personnel	DR				none	DR				none
Sampling Method	11011, 60201, 18100				none	11011, 60201, 18100				none
Staff Height	below staff plate	TA			ft					
Storm Or Non-Storm	N				none	N				none
M=MC SM 9213D 20TH										
Escherichia coli	1800	C			CFU/100ml	900				CFU/100ml
M=MC SM 9222D 20TH										
Fecal Coliform	2600				CFU/100ml	1700				CFU/100ml

King County Environmental Lab Analytical Report

PROJECT: 421195-190

Locator: VA42A
 Descrip: JUDD CREEK AT SW 2
 Sampled: 05/05/09 8:20:24 AM
 Lab ID: L47987-3
 Matrix: FRESH WTR

Locator: VA45A
 Descrip: MILETA CREEK DOWNS
 Sampled: 05/05/09 9:22:23 AM
 Lab ID: L47987-4
 Matrix: FRESH WTR

Locator: VA65A
 Descrip: GORSUCH CREEK NEAR
 Sampled: 05/05/09 9:39:44 AM
 Lab ID: L47987-5
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
-Wet Weight Basis						-Wet Weight Basis					-Wet Weight Basis				
COMBINED LABS															
M=CV KEROUEL & AMINOT 1997															
Ammonia Nitrogen	0.0287		0.005	0.01	mg/L	0.0074	<RDL	0.005	0.01	mg/L	0.0105		0.005	0.01	mg/L
M=CV SM2130-B															
Turbidity	48		0.2	0.5	NTU	17.8		0.2	0.5	NTU	27.5		0.2	0.5	NTU
M=CV SM2320-B															
Total Alkalinity	28.4		1	5	mg CaCO3/L	17.3		1	5	mg CaCO3/L	29.7		1	5	mg CaCO3/L
M=CV SM2540-D															
Total Suspended Solids	162		2.5	5	mg/L	4.2		0.5	1	mg/L	100		1.3	2.5	mg/L
M=CV SM4500-N-C															
Total Nitrogen	1.69		0.05	0.1	mg/L	2.5		0.05	0.1	mg/L	1.2		0.05	0.1	mg/L
M=CV SM4500-NO3-F															
Nitrite + Nitrate Nitrogen	0.479		0.01	0.04	mg/L	2		0.01	0.04	mg/L	0.567		0.01	0.04	mg/L
M=CV SM4500-P-B,F															
Total Phosphorus	0.197		0.005	0.01	mg/L	0.0394		0.005	0.01	mg/L	0.145		0.005	0.01	mg/L
M=CV SM4500-P-F															
Orthophosphate Phosphorus	0.0187		0.002	0.005	mg/L	0.00555		0.002	0.005	mg/L	0.0191		0.002	0.005	mg/L
M=ES HYDROLAB															
Conductivity, Field	82		0.5	10	umhos/cm	81.5		0.5	10	umhos/cm	81.2		0.5	10	umhos/cm
Dissolved Oxygen, Field	11.1		0.5	1	mg/L	10.2		0.5	1	mg/L	10.9		0.5	1	mg/L
pH, Field	7.25				pH	7.13				pH	7.59				pH
Sample Temperature, Field	9.69				deg C	9.4				deg C	9.67				deg C
M=ES NONE															
Field Personnel	DR				none	DR				none	DR				none
Sampling Method	11011, 60201, 18100, 80011				none	11011, 60201, 18100				none	11011, 60201, 18100				none
Staff Height	1.18				ft										
Storm Or Non-Storm	N				none	N				none	N				none
M=MC SM 9213D 20TH															
Escherichia coli	7300	C			CFU/100ml	510				CFU/100ml	2000				CFU/100ml
M=MC SM 9222D 20TH															
Fecal Coliform	5200				CFU/100ml	420				CFU/100ml	1100				CFU/100ml

King County Environmental Lab Analytical Report

PROJECT: 421195-190

Locator: VA12A
 Descrip: SHINGLEMILL CREEK
 Sampled: 06/02/09 9:51:24 AM
 Lab ID: L48212-1
 Matrix: FRESH WTR

Locator: VA41A
 Descrip: FISHER CREEK UPSTR
 Sampled: 06/02/09 8:12:19 AM
 Lab ID: L48212-2
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
COMBINED LABS										
M=CV KEROUEL & AMINOT 1997										
Ammonia Nitrogen	0.0173		0.005	0.01	mg/L	0.0274		0.005	0.01	mg/L
M=CV SM2130-B										
Turbidity	0.527		0.2	0.5	NTU	2.3		0.2	0.5	NTU
M=CV SM2320-B										
Total Alkalinity	71.2		1	5	mg CaCO3/L	54.2		1	5	mg CaCO3/L
M=CV SM2540-D										
Total Suspended Solids	2.3		0.5	1	mg/L	9.7		0.5	1	mg/L
M=CV SM4500-N-C										
Total Nitrogen	0.907		0.05	0.1	mg/L	1.16		0.05	0.1	mg/L
M=CV SM4500-NO3-F										
Nitrite + Nitrate Nitrogen	0.785		0.01	0.04	mg/L	0.937		0.01	0.04	mg/L
M=CV SM4500-P-B,F										
Total Phosphorus	0.0524		0.005	0.01	mg/L	0.0708		0.005	0.01	mg/L
M=CV SM4500-P-F										
Orthophosphate Phosphorus	0.0389		0.002	0.005	mg/L	0.0452		0.002	0.005	mg/L
M=CV WHITLEDGE 1981										
Silica	31		0.5	1	mg/L	32		0.5	1	mg/L
M=ES HYDROLAB										
Conductivity, Field	176		0.5	10	umhos/cm	144		0.5	10	umhos/cm
Dissolved Oxygen, Field	10.7		0.5	1	mg/L	9.8		0.5	1	mg/L
pH, Field	7.72				pH	7.54				pH
Sample Temperature, Field	11.55				deg C	11.6				deg C
M=ES NONE										
Field Personnel	DR				none	DR				none
Sampling Method	11011, 60201, 18100				none	11011, 60201, 18100				none
Staff Height										
Storm Or Non-Storm	N				none	N				none
M=MC SM 9213D 20TH										
Escherichia coli	34				CFU/100ml	260				CFU/100ml
M=MC SM 9222D 20TH										
Fecal Coliform	33				CFU/100ml	220				CFU/100ml

King County Environmental Lab Analytical Report

PROJECT: 421195-190

Locator: VA42A
 Descrip: JUDD CREEK AT SW 2
 Sampled: 06/02/09 8:35:29 AM
 Lab ID: L48212-3
 Matrix: FRESH WTR

Locator: VA45A
 Descrip: MILETA CREEK DOWNS
 Sampled: 06/02/09 9:10:40 AM
 Lab ID: L48212-4
 Matrix: FRESH WTR

Locator: VA65A
 Descrip: GORSUCH CREEK NEAR
 Sampled: 06/02/09 9:34:04 AM
 Lab ID: L48212-5
 Matrix: FRESH WTR

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units		
		-Wet Weight Basis						-Wet Weight Basis						-Wet Weight Basis			
COMBINED LABS																	
M=CV KEROUEL & AMINOT 1997																	
Ammonia Nitrogen	0.0181		0.005	0.01	mg/L	0.0151		0.005	0.01	mg/L	0.0188		0.005	0.01	mg/L		
M=CV SM2130-B																	
Turbidity	0.98		0.2	0.5	NTU	5.72		0.2	0.5	NTU	1.16		0.2	0.5	NTU		
M=CV SM2320-B																	
Total Alkalinity	60.5		1	5	mg CaCO3/L	35.6		1	5	mg CaCO3/L	74.7		1	5	mg CaCO3/L		
M=CV SM2540-D																	
Total Suspended Solids	3.2		0.5	1	mg/L	60.6		0.5	1	mg/L	5.1		0.5	1	mg/L		
M=CV SM4500-N-C																	
Total Nitrogen	1.13		0.05	0.1	mg/L	1.59		0.05	0.1	mg/L	1.62		0.05	0.1	mg/L		
M=CV SM4500-NO3-F																	
Nitrite + Nitrate Nitrogen	0.968		0.01	0.04	mg/L	1.27		0.01	0.04	mg/L	1.49		0.01	0.04	mg/L		
M=CV SM4500-P-B,F																	
Total Phosphorus	0.0443		0.005	0.01	mg/L	0.0654		0.005	0.01	mg/L	0.0588		0.005	0.01	mg/L		
M=CV SM4500-P-F																	
Orthophosphate Phosphorus	0.0331		0.002	0.005	mg/L	0.01		0.002	0.005	mg/L	0.0438		0.002	0.005	mg/L		
M=CV WHITLEDGE 1981																	
Silica	31.6		0.5	1	mg/L	29.2		0.5	1	mg/L	32.8		0.5	1	mg/L		
M=ES HYDROLAB																	
Conductivity, Field	155		0.5	10	umhos/cm	114		0.5	10	umhos/cm	188		0.5	10	umhos/cm		
Dissolved Oxygen, Field	9.9		0.5	1	mg/L	8.3		0.5	1	mg/L	8.8		0.5	1	mg/L		
pH, Field	7.75				pH	8.33				pH	8.78				pH		
Sample Temperature, Field	11.98				deg C	11.66				deg C	12.2				deg C		
M=ES NONE																	
Field Personnel	DR				none	DR				none	DR				none		
Sampling Method	11011, 60201, 18100, 80011				none	11011, 60201, 18100				none	11011, 60201, 18100				none		
Staff Height	0.56				ft												
Storm Or Non-Storm	N				none	N				none	N				none		
M=MC SM 9213D 20TH																	
Escherichia coli	73				CFU/100ml	520				CFU/100ml	20				CFU/100ml		
M=MC SM 9222D 20TH																	
Fecal Coliform	50				CFU/100ml	500				CFU/100ml	21				CFU/100ml		

King County Environmental Lab Analytical Report

Project: 421195-190
 Locator: VA12A
 Descrip: SHINGLEMILL CREEK
 Sample: L48473-1
 Matrix: LK FRESH WTR
 ColDate: 7/8/09 9:23

WET Weight Basis

Project: 421195-190
 Locator: VA41A
 Descrip: FISHER CREEK UPSTR
 Sample: L48473-2
 Matrix: LK FRESH WTR
 ColDate: 7/8/09 7:57

WET Weight Basis

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV KEROUEL & AMINOT 1997										
Ammonia Nitrogen	0.0092	<RDL	0.005	0.01	mg/L	0.0109		0.005	0.01	mg/L
CV SM2130-B										
Turbidity	0.96		0.2	0.5	NTU	4.13		0.2	0.5	NTU
CV SM2320-B										
Total Alkalinity	75.9		1	5	mg CaCO3/L	57.7		1	5	mg CaCO3/L
CV SM2540-D										
Total Suspended Solids	3.3		0.5	1	mg/L	8.6		0.5	1	mg/L
CV SM4500-N-C										
Total Nitrogen	0.806		0.05	0.1	mg/L	1.01		0.05	0.1	mg/L
CV SM4500-NO3-F										
Nitrite + Nitrate Nitrogen	0.764		0.01	0.04	mg/L	0.879		0.01	0.04	mg/L
CV SM4500-P-B,F										
Total Phosphorus	0.0556		0.005	0.01	mg/L	0.0734		0.005	0.01	mg/L
CV SM4500-P-F										
Orthophosphate Phosphorus	0.0456		0.002	0.005	mg/L	0.0496		0.002	0.005	mg/L
CV WHITLEDGE 1981										
Silica	32.1		0.5	1	mg/L	33.6		0.5	1	mg/L
ES HYDROLAB										
Conductivity, Field	188		0.5	10	umhos/cm	136		0.5	10	umhos/cm
Dissolved Oxygen, Field	9.6		0.5	1	mg/L	11.1		0.5	1	mg/L
Sample Temperature, Field	11.46				deg C	11.62				deg C
pH, Field	7.74				pH	7.56				pH
ES NONE										
Field Personnel	DR				none	DR				none
Sampling Method	11011, 60201, 18100				none	11011, 60201, 18100				none
Storm Or Non-Storm	N				none	N				none
MC SM 9213D 20TH										
Escherichia coli	38				CFU/100ml	400				CFU/100ml
MC SM 9222D 20TH										
Fecal Coliform	28				CFU/100ml	290				CFU/100ml
ES NONE										
Staff Height										

King County Environmental Lab Analytical Report

Project: 421195-190
 Locator: VA42A
 Descrip: JUDD CREEK AT SW 2
 Sample: L48473-3
 Matrix: LK FRESH WTR
 ColDate: 7/8/09 8:13

WET Weight Basis

Project: 421195-190
 Locator: VA45A
 Descrip: MILETA CREEK DOWNS
 Sample: L48473-4
 Matrix: LK FRESH WTR
 ColDate: 7/8/09 8:34

WET Weight Basis

Project: 421195-190
 Locator: VA65A
 Descrip: GORSUCH CREEK NEAR
 Sample: L48473-5
 Matrix: LK FRESH WTR
 ColDate: 7/8/09 9:05

WET Weight Basis

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV KEROUEL & AMINOT 1997															
Ammonia Nitrogen	0.006	<RDL	0.005	0.01	mg/L	0.0103		0.005	0.01	mg/L	0.0096	<RDL	0.005	0.01	mg/L
CV SM2130-B															
Turbidity	1.6		0.2	0.5	NTU	1.48		0.2	0.5	NTU	1.65		0.2	0.5	NTU
CV SM2320-B															
Total Alkalinity	66.7		1	5	mg CaCO3/L	45.6		1	5	mg CaCO3/L	80.7		1	5	mg CaCO3/L
CV SM2540-D															
Total Suspended Solids	3.7		0.5	1	mg/L	7.5		0.5	1	mg/L	15.5		0.5	1	mg/L
CV SM4500-N-C															
Total Nitrogen	1.1		0.05	0.1	mg/L	1.88		0.05	0.1	mg/L	1.55		0.05	0.1	mg/L
CV SM4500-NO3-F															
Nitrite + Nitrate Nitrogen	1.02		0.01	0.04	mg/L	1.72		0.01	0.04	mg/L	1.47		0.01	0.04	mg/L
CV SM4500-P-B,F															
Total Phosphorus	0.049		0.005	0.01	mg/L	0.0121		0.005	0.01	mg/L	0.063		0.005	0.01	mg/L
CV SM4500-P-F															
Orthophosphate Phosphorus	0.0381		0.002	0.005	mg/L	0.00925		0.002	0.005	mg/L	0.0538		0.002	0.005	mg/L
CV WHITLEDGE 1981															
Silica	34.4		0.5	1	mg/L	32.3		0.5	1	mg/L	35		0.5	1	mg/L
ES HYDROLAB															
Conductivity, Field	170		0.5	10	umhos/cm	145		0.5	10	umhos/cm	198		0.5	10	umhos/cm
Dissolved Oxygen, Field	10.4		0.5	1	mg/L	8.3		0.5	1	mg/L	8.9		0.5	1	mg/L
Sample Temperature, Field	11.62				deg C	11.85				deg C	12.21				deg C
pH, Field	7.77				pH	6.91				pH	7.61				pH
ES NONE															
Field Personnel	DR				none	DR				none	DR				none
Sampling Method	11011, 60201, 18100, 80011				none	11011, 60201, 18100				none	11011, 60201, 18100				none
Storm Or Non-Storm	N				none	N				none	N				none
MC SM 9213D 20TH															
Escherichia coli	150				CFU/100ml	530				CFU/100ml	30				CFU/100ml
MC SM 9222D 20TH															
Fecal Coliform	110				CFU/100ml	60				CFU/100ml	17				CFU/100ml
ES NONE															
Staff Height	0.48				ft										

King County Environmental Lab Analytical Report

Project: 421195-190
 Locator: VA12A
 Descrip: SHINGLEMILL CREEK
 Sample: L48676-1
 Matrix: LK FRESH WTR
 ColDate: 8/4/09 9:02

WET Weight Basis

Project: 421195-190
 Locator: VA41A
 Descrip: FISHER CREEK UPSTR
 Sample: L48676-2
 Matrix: LK FRESH WTR
 ColDate: 8/4/09 9:46

WET Weight Basis

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV KEROUEL & AMINOT 1997										
Ammonia Nitrogen	0.0131		0.005	0.01	mg/L	0.0137		0.005	0.01	mg/L
CV SM2130-B										
Turbidity	1.08		0.2	0.5	NTU	2.77		0.2	0.5	NTU
CV SM2320-B										
Total Alkalinity	77.8		1	5	mg CaCO3/L	58		1	5	mg CaCO3/L
CV SM2540-D										
Total Suspended Solids	3.5		0.5	1	mg/L	8.1		0.5	1	mg/L
CV SM4500-N-C										
Total Nitrogen	0.812		0.05	0.1	mg/L	0.896		0.05	0.1	mg/L
CV SM4500-NO3-F										
Nitrite + Nitrate Nitrogen	0.732		0.01	0.04	mg/L	0.763		0.01	0.04	mg/L
CV SM4500-P-B,F										
Total Phosphorus	0.0588		0.005	0.01	mg/L	0.0737		0.005	0.01	mg/L
CV SM4500-P-F										
Orthophosphate Phosphorus	0.0501		0.002	0.005	mg/L	0.058		0.002	0.005	mg/L
CV WHITLEDGE 1981										
Silica	34		0.05	0.1	mg/L	36.2		0.05	0.1	mg/L
ES HYDROLAB										
Conductivity, Field	194		0.5	10	umhos/cm	156		0.5	10	umhos/cm
Dissolved Oxygen, Field	9.9		0.5	1	mg/L	9.3		0.5	1	mg/L
Sample Temperature, Field	13.02				deg C	13.93				deg C
pH, Field	7.69				pH	7.62				pH
ES NONE										
Field Personnel	JO				none	JO				none
Sampling Method	11011, 60201, 18100				none	11011, 60201, 18100				none
Storm Or Non-Storm	N				none	N				none
MC SM 9213D 20TH										
Escherichia coli	50				CFU/100ml	370				CFU/100ml
MC SM 9222D 20TH										
Fecal Coliform	30				CFU/100ml	360				CFU/100ml
ES NONE										
Staff Height										

King County Environmental Lab Analytical Report

Project: 421195-190
 Locator: VA42A
 Descrip: JUDD CREEK AT SW 2
 Sample: L48676-3
 Matrix: LK FRESH WTR
 ColDate: 8/4/09 10:08

WET Weight Basis

Project: 421195-190
 Locator: VA45A
 Descrip: MILETA CREEK DOWNS
 Sample: L48676-4
 Matrix: LK FRESH WTR
 ColDate: 8/4/09 10:48

WET Weight Basis

Project: 421195-190
 Locator: VA65A
 Descrip: GORSUCH CREEK NEAR
 Sample: L48676-5
 Matrix: LK FRESH WTR
 ColDate: 8/4/09 11:49

WET Weight Basis

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units		
CV KEROUEL & AMINOT 1997																	
Ammonia Nitrogen	0.0096	<RDL	0.005	0.01	mg/L	0.0105		0.005	0.01	mg/L	0.0138		0.005	0.01	mg/L		
CV SM2130-B																	
Turbidity	1.84		0.2	0.5	NTU	1.6		0.2	0.5	NTU	1.66		0.2	0.5	NTU		
CV SM2320-B																	
Total Alkalinity	69		1	5	mg CaCO3/L	47.3		1	5	mg CaCO3/L	73.3		1	5	mg CaCO3/L		
CV SM2540-D																	
Total Suspended Solids	2.7		0.5	1	mg/L	2.7		0.5	1	mg/L	4		0.5	1	mg/L		
CV SM4500-N-C																	
Total Nitrogen	1.07		0.05	0.1	mg/L	1.55		0.05	0.1	mg/L	1.58		0.05	0.1	mg/L		
CV SM4500-NO3-F																	
Nitrite + Nitrate Nitrogen	0.976		0.01	0.04	mg/L	1.37		0.01	0.04	mg/L	1.39		0.01	0.04	mg/L		
CV SM4500-P-B,F																	
Total Phosphorus	0.05		0.005	0.01	mg/L	0.0137		0.005	0.01	mg/L	0.0702		0.005	0.01	mg/L		
CV SM4500-P-F																	
Orthophosphate Phosphorus	0.0437		0.002	0.005	mg/L	0.00992		0.002	0.005	mg/L	0.0595		0.002	0.005	mg/L		
CV WHITLEDGE 1981																	
Silica	36.5		0.05	0.1	mg/L	33.4		0.05	0.1	mg/L	36.7		0.05	0.1	mg/L		
ES HYDROLAB																	
Conductivity, Field	180		0.5	10	umhos/cm	142		0.5	10	umhos/cm	207		0.5	10	umhos/cm		
Dissolved Oxygen, Field	9.1		0.5	1	mg/L	6.9		0.5	1	mg/L	8.2		0.5	1	mg/L		
Sample Temperature, Field	14.23				deg C	13.92				deg C	14.6				deg C		
pH, Field	7.81				pH	6.88				pH	7.07				pH		
ES NONE																	
Field Personnel	JO				none	JO				none	JO				none		
Sampling Method	11011, 60201, 18100, 80011				none	11011, 60201, 18100				none	11011, 60201, 18100				none		
Storm Or Non-Storm	N				none	N				none	N				none		
MC SM 9213D 20TH																	
Escherichia coli	540				CFU/100ml	140				CFU/100ml	150				CFU/100ml		
MC SM 9222D 20TH																	
Fecal Coliform	210				CFU/100ml	29				CFU/100ml	56				CFU/100ml		
ES NONE																	
Staff Height	0.46				ft												

King County Environmental Lab Analytical Report

Project: 421195-190
 Locator: VA12A
 Descrip: SHINGLEMILL CREEK
 Sample: L48953-1
 Matrix: LK FRESH WTR
 ColDate: 9/9/09 9:23

WET Weight Basis

Project: 421195-190
 Locator: VA41A
 Descrip: FISHER CREEK UPSTR
 Sample: L48953-2
 Matrix: LK FRESH WTR
 ColDate: 9/9/09 7:22

WET Weight Basis

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV KEROUEL & AMINOT 1997										
Ammonia Nitrogen	0.0119		0.005	0.01	mg/L	0.0128		0.005	0.01	mg/L
CV SM2130-B										
Turbidity	1.6		0.2	0.5	NTU	1.37		0.2	0.5	NTU
CV SM2320-B										
Total Alkalinity	75.6		1	5	mg CaCO3/L	55.2		1	5	mg CaCO3/L
CV SM2540-D										
Total Suspended Solids	9.3		0.5	1	mg/L	5.1		0.5	1	mg/L
CV SM4500-N-C										
Total Nitrogen	0.879		0.05	0.1	mg/L	0.976		0.05	0.1	mg/L
CV SM4500-NO3-F										
Nitrite + Nitrate Nitrogen	0.818		0.01	0.04	mg/L	0.801		0.01	0.04	mg/L
CV SM4500-P-B,F										
Total Phosphorus	0.0643		0.005	0.01	mg/L	0.0704		0.005	0.01	mg/L
CV SM4500-P-F										
Orthophosphate Phosphorus	0.0485		0.002	0.005	mg/L	0.0499		0.002	0.005	mg/L
CV WHITLEDGE 1981										
Silica	31.8		0.5	1	mg/L	33.2		0.5	1	mg/L
ES HYDROLAB										
Conductivity, Field	191		0.5	10	umhos/cm	160		0.5	10	umhos/cm
Dissolved Oxygen, Field	10.6		0.5	1	mg/L	10.3		0.5	1	mg/L
Sample Temperature, Field	11.31				deg C	12.1				deg C
pH, Field	7.87				pH	7.64				pH
ES NONE										
Field Personnel	DR				none	DR				none
Sampling Method	11011, 60201, 18100				none	11011, 60201, 18100				none
Storm Or Non-Storm	N				none	N				none
MC SM 9213D 20TH										
Escherichia coli	13				CFU/100ml	250				CFU/100ml
MC SM 9222D 20TH										
Fecal Coliform	6				CFU/100ml	200				CFU/100ml
ES NONE										
Staff Height										

King County Environmental Lab Analytical Report

Project: 421195-190
 Locator: VA42A
 Descrip: JUDD CREEK AT SW 2
 Sample: L48953-3
 Matrix: LK FRESH WTR
 ColDate: 9/9/09 7:36

WET Weight Basis

Parameters	Value	Qual	MDL	RDL	Units
CV KEROUEL & AMINOT 1997					
Ammonia Nitrogen	0.0099	<RDL	0.005	0.01	mg/L
CV SM2130-B					
Turbidity	1.06		0.2	0.5	NTU
CV SM2320-B					
Total Alkalinity	63.6		1	5	mg CaCO3/L
CV SM2540-D					
Total Suspended Solids	3		0.5	1	mg/L
CV SM4500-N-C					
Total Nitrogen	1.06		0.05	0.1	mg/L
CV SM4500-NO3-F					
Nitrite + Nitrate Nitrogen	0.888		0.01	0.04	mg/L
CV SM4500-P-B,F					
Total Phosphorus	0.056		0.005	0.01	mg/L
CV SM4500-P-F					
Orthophosphate Phosphorus	0.0377		0.002	0.005	mg/L
CV WHITLEDGE 1981					
Silica	33.6		0.5	1	mg/L
ES HYDROLAB					
Conductivity, Field	171		0.5	10	umhos/cm
Dissolved Oxygen, Field	10.3		0.5	1	mg/L
Sample Temperature, Field	12.07				deg C
pH, Field	7.81				pH
ES NONE					
Field Personnel	DR				none
Sampling Method	11011, 60201, 18100, 80011				none
Storm Or Non-Storm	N				none
MC SM 9213D 20TH					
Escherichia coli	200				CFU/100ml
MC SM 9222D 20TH					
Fecal Coliform	190				CFU/100ml
ES NONE					
Staff Height	0.5				ft

Project: 421195-190
 Locator: VA45A
 Descrip: MILETA CREEK DOWNS
 Sample: L48953-4
 Matrix: LK FRESH WTR
 ColDate: 9/9/09 8:00

WET Weight Basis

Value	Qual	MDL	RDL	Units
0.0096	<RDL	0.005	0.01	mg/L
2.44		0.2	0.5	NTU
40.7		1	5	mg CaCO3/L
28.1		0.5	1	mg/L
1.38		0.05	0.1	mg/L
1.15		0.01	0.04	mg/L
0.0397		0.005	0.01	mg/L
0.0102		0.002	0.005	mg/L
32.2		0.5	1	mg/L
161		0.5	10	umhos/cm
7.2		0.5	1	mg/L
12.32				deg C
7.01				pH
DR				none
11011, 60201, 18100				none
N				none
320				CFU/100ml
250				CFU/100ml

Project: 421195-190
 Locator: VA65A
 Descrip: GORSUCH CREEK NEAR
 Sample: L48953-5
 Matrix: LK FRESH WTR
 ColDate: 9/9/09 9:05

WET Weight Basis

Value	Qual	MDL	RDL	Units
0.0119		0.005	0.01	mg/L
3.8		0.2	0.5	NTU
79.8		1	5	mg CaCO3/L
6.7		0.5	1	mg/L
1.45		0.05	0.1	mg/L
1.25		0.01	0.04	mg/L
0.0741		0.005	0.01	mg/L
0.0591		0.002	0.005	mg/L
33.4		0.5	1	mg/L
199		0.5	10	umhos/cm
8.1		0.5	1	mg/L
12.39				deg C
7.95				pH
DR				none
11011, 60201, 18100				none
N				none
72				CFU/100ml
64				CFU/100ml

Appendix B-2

Long-Term Monitoring Sites Water Quality Data

King County Environmental Lab Analytical Report

Project: 421195-190
 Locator: VAS_W-12
 Descrip: W-12-HOLLYMERE
 Matrix: LJ GRND WTR
 Sample: L49078-14
 ColDate: 9/16/09 9:30

Project: 421195-190
 Locator: VAS_W-07
 Descrip: W-07-TOOMEY/SORGE
 Matrix: LJ GRND WTR
 Sample: L49078-10
 ColDate: #####

Project: 421195-190
 Locator: VAS_W-13
 Descrip: W-13-MISTY ISLE FA
 Matrix: LJ GRND WTR
 Sample: L49078-16
 ColDate: 9/16/09 12:50

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV SM4110B CL															
Chloride	4.13		0.05	0.1	mg/L	2.79		0.05	0.1	mg/L	8.15		0.05	0.1	mg/L
CV SM4500-NO3-F															
Nitrite + Nitrate Nitrogen		<MDL	0.01	0.04	mg/L	0.021	<RDL	0.01	0.04	mg/L	2.23		0.01	0.04	mg/L
MT EPA 200.8*SW846 6020A															
Arsenic, Total, ICP-MS	6.04		0.1	0.5	ug/L	12.1		0.1	0.5	ug/L	1.13		0.1	0.5	ug/L
CV KEROUEL+AMINOT 1997															
Ammonia Nitrogen	0.192		0.005	0.01	mg/L	0.384		0.025	0.05	mg/L		<MDL	0.005	0.01	mg/L
CV SM2320-B															
Total Alkalinity	135		1	5	mg CaCO3/L	134		1	5	mg CaCO3/L	72.2		1	5	mg CaCO3/L
CV SM2540-D															
Total Suspended Solids	4.42		1	1.9	mg/L	1.2		0.5	1	mg/L		<MDL	0.5	1	mg/L
CV SM4500-N-C															
Total Nitrogen	0.19		0.05	0.1	mg/L	0.408		0.05	0.1	mg/L	2.28		0.05	0.1	mg/L
CV SM4500-P-B,F															
Total Phosphorus	0.18		0.005	0.01	mg/L	0.314		0.005	0.01	mg/L	0.023		0.005	0.01	mg/L
CV SM4500-P-F															
Orthophosphate Phosphorus	0.146		0.002	0.005	mg/L	0.273		0.002	0.005	mg/L	0.0225		0.002	0.005	mg/L
CV WHITLEDGE 1981															
Silica	29.1		0.05	0.1	mg/L	42.1		0.05	0.1	mg/L	33.9		0.05	0.1	mg/L
ES NONE															
Sample Information															
ES NONE															
Field Personnel	EWF/DR				none	EWF/DR				none	EWF/DR				none
Sample Code	Grab				none	Grab				none	Grab				none

King County Environmental Lab Analytical Report

Project: 421195-190
 Locator: VAS_W-06
 Descrip: W-06-PACKARD/HEADL
 Matrix: LJ GRND WTR
 Sample: L49078-18
 ColDate: 9/16/09 8:30

Project: 421195-190
 Locator: GROUNDNDUP
 Descrip: GROUNDWATER DUPLIC
 Matrix: LJ GRND WTR
 Sample: L49078-19
 ColDate: 9/16/09 8:35

Project: 421195-190
 Locator: VAS_W-14
 Descrip: W-14-KRISHNAN
 Matrix: LJ GRND WTR
 Sample: L49078-2
 ColDate: 9/16/09 12:00

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV SM4110B CL															
Chloride	3.18		0.05	0.1	mg/L	3.21		0.05	0.1	mg/L	4.53		0.05	0.1	mg/L
CV SM4500-NO3-F															
Nitrite + Nitrate Nitrogen	1.31		0.01	0.04	mg/L	1.28		0.01	0.04	mg/L	0.039	<RDL	0.01	0.04	mg/L
MT EPA 200.8*SW846 6020A															
Arsenic, Total, ICP-MS	0.946		0.1	0.5	ug/L	0.96		0.1	0.5	ug/L	1.31		0.1	0.5	ug/L
CV KEROUEL+AMINOT 1997															
Ammonia Nitrogen	<MDL		0.005	0.01	mg/L	<MDL		0.005	0.01	mg/L					
CV SM2320-B															
Total Alkalinity	50.3		1	5	mg CaCO3/L	50.1		1	5	mg CaCO3/L					
CV SM2540-D															
Total Suspended Solids	<MDL		0.5	1	mg/L	<MDL		0.5	1	mg/L					
CV SM4500-N-C															
Total Nitrogen	1.26		0.05	0.1	mg/L	1.35		0.05	0.1	mg/L					
CV SM4500-P-B,F															
Total Phosphorus	0.0269		0.005	0.01	mg/L	0.0291		0.005	0.01	mg/L					
CV SM4500-P-F															
Orthophosphate Phosphorus	0.0272		0.002	0.005	mg/L	0.0263		0.002	0.005	mg/L					
CV WHITLEDGE 1981															
Silica	28.7		0.05	0.1	mg/L	28.5		0.05	0.1	mg/L					
ES NONE															
Sample Information						FREP@L49078-18, W-06				none					
ES NONE															
Field Personnel	EWF/DR				none	EWF/DR				none	EWF/DR				none
Sample Code	Grab				none	Grab				none	Grab				none

King County Environmental Lab Analytical Report

Project: 421195-190
 Locator: VAS_W-17
 Descrip: W-17-PERLA
 Matrix: LJ GRND WTR
 Sample: L49078-4
 ColDate: 9/15/09 12:05

Project: 421195-190
 Locator: VAS_W-02A
 Descrip: W-02A-HEIGHTS W #1
 Matrix: LJ GRND WTR
 Sample: L49078-5
 ColDate: 9/15/09 9:45

Project: 421195-190
 Locator: VAS_W-03
 Descrip: W-03-GLEN ACRES
 Matrix: LJ GRND WTR
 Sample: L49078-6
 ColDate: 9/15/09 8:15

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV SM4110B CL															
Chloride	4.36		0.05	0.1	mg/L	3.93		0.05	0.1	mg/L	8.13		0.05	0.1	mg/L
CV SM4500-NO3-F															
Nitrite + Nitrate Nitrogen	2.28		0.02	0.08	mg/L	1.44		0.02	0.08	mg/L	0.342		0.01	0.04	mg/L
MT EPA 200.8*SW846 6020A															
Arsenic, Total, ICP-MS	0.42	<RDL	0.1	0.5	ug/L	8.81		0.1	0.5	ug/L	1.05		0.1	0.5	ug/L
CV KEROUEL+AMINOT 1997															
Ammonia Nitrogen															
CV SM2320-B															
Total Alkalinity															
CV SM2540-D															
Total Suspended Solids															
CV SM4500-N-C															
Total Nitrogen															
CV SM4500-P-B,F															
Total Phosphorus															
CV SM4500-P-F															
Orthophosphate Phosphorus															
CV WHITLEDGE 1981															
Silica															
ES NONE															
Sample Information															
ES NONE															
Field Personnel	EWF/DR				none	EWF/DR				none	EWF/DR				none
Sample Code	Grab				none	Grab				none	Grab				none

King County Environmental Lab Analytical Report

Project: 421195-190
 Locator: VAS_W-04
 Descrip: W-04-RODRIQUES
 Matrix: LJ GRND WTR
 Sample: L49078-7
 ColDate: 9/15/09 10:20

Project: 421195-190
 Locator: VAS_W-21
 Descrip: W-21-KUPERBERG
 Matrix: LJ GRND WTR
 Sample: L49078-8
 ColDate: 9/15/09 12:52

Project: 421195-190
 Locator: VAS_S-03
 Descrip: S-03-ATLAS WATER
 Matrix: LJ GRND WTR
 Sample: L49078-9
 ColDate: 9/15/09 10:55

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV SM4110B CL															
Chloride	3.79		0.05	0.1	mg/L	4.46		0.05	0.1	mg/L	4.9		0.05	0.1	mg/L
CV SM4500-NO3-F															
Nitrite + Nitrate Nitrogen		<MDL	0.01	0.04	mg/L		<MDL	0.01	0.04	mg/L	1.57		0.01	0.04	mg/L
MT EPA 200.8*SW846 6020A															
Arsenic, Total, ICP-MS	18.7		0.1	0.5	ug/L	4.04		0.1	0.5	ug/L	1.83		0.1	0.5	ug/L
CV KEROUEL+AMINOT 1997															
Ammonia Nitrogen															
CV SM2320-B															
Total Alkalinity															
CV SM2540-D															
Total Suspended Solids															
CV SM4500-N-C															
Total Nitrogen															
CV SM4500-P-B,F															
Total Phosphorus															
CV SM4500-P-F															
Orthophosphate Phosphorus															
CV WHITLEDGE 1981															
Silica															
ES NONE															
Sample Information															
ES NONE															
Field Personnel	EWF/DR				none	EWF/DR				none	EWF/DR				none
Sample Code	Grab				none	Grab				none	Grab				none

King County Environmental Lab Analytical Report

Project: 421195-190
 Locator: VAS_W-10A
 Descrip: W-10A-GOLD BEACH W
 Matrix: LJ GRND WTR
 Sample: L49078-12
 ColDate: 9/16/09 10:45

Project: 421195-190
 Locator: VAS_W-09A
 Descrip: WHITE #1
 Matrix: LJ GRND WTR
 Sample: L49078-13
 ColDate: 9/16/09 9:50

Project: 421195-190
 Locator: VAS_W-20
 Descrip: W-20-JOHNSON
 Matrix: LJ GRND WTR
 Sample: L49078-17
 ColDate: 9/15/09 14:30

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV SM4110B CL															
Chloride	11.8		0.1	0.2	mg/L	4.92		0.05	0.1	mg/L	4.4		0.05	0.1	mg/L
CV SM4500-NO3-F															
Nitrite + Nitrate Nitrogen	5.38		0.05	0.2	mg/L	0.013	<RDL	0.01	0.04	mg/L	4.19		0.05	0.2	mg/L
MT EPA 200.8*SW846 6020A															
Arsenic, Total, ICP-MS	3.2		0.1	0.5	ug/L	4.01		0.1	0.5	ug/L	0.587		0.1	0.5	ug/L
CV KEROUEL+AMINOT 1997															
Ammonia Nitrogen															
CV SM2320-B															
Total Alkalinity															
CV SM2540-D															
Total Suspended Solids															
CV SM4500-N-C															
Total Nitrogen															
CV SM4500-P-B,F															
Total Phosphorus															
CV SM4500-P-F															
Orthophosphate Phosphorus															
CV WHITLEDGE 1981															
Silica															
ES NONE															
Sample Information															
ES NONE															
Field Personnel	EWF/DR				none	EWF/DR				none	EWF/DR				none
Sample Code	Grab				none	Grab				none	Grab				none

King County Environmental Lab Analytical Report

Project: 421195-190
 Locator: VAS_W-16A
 Descrip: W-16A-BAKER/KLEMKA
 Matrix: LJ GRND WTR
 Sample: L49078-15
 ColDate: 9/15/09 11:35

Project: 421195-190
 Locator: ATMOSBLANK
 Descrip: ATMOSPHERE BLANK
 Matrix: LN BLANK WTR
 Sample: L49078-20
 ColDate: 9/16/09 12:00

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV SM4110B CL										
Chloride	3.07		0.05	0.1	mg/L					
CV SM4500-NO3-F										
Nitrite + Nitrate Nitrogen	3.37		0.05	0.2	mg/L					
MT EPA 200.8*SW846 6020A										
Arsenic, Total, ICP-MS	0.46	<RDL	0.1	0.5	ug/L		<MDL	0.1	0.5	ug/L
CV KEROUEL+AMINOT 1997										
Ammonia Nitrogen										
CV SM2320-B										
Total Alkalinity										
CV SM2540-D										
Total Suspended Solids										
CV SM4500-N-C										
Total Nitrogen										
CV SM4500-P-B,F										
Total Phosphorus										
CV SM4500-P-F										
Orthophosphate Phosphorus										
CV WHITLEDGE 1981										
Silica										
ES NONE										
Sample Information						ABInk@L49078				none
ES NONE										
Field Personnel	EWF/DR				none	EWF/DR				none
Sample Code	Grab				none	Grab				none

Appendix B-3

Monitoring Well Quality Data

King County Environmental Lab Analytical Report

Project: 421195-191 Locator: VAS_W-61 Descrip: VASHON ISLAND WELL Sample: L49077-2 Matrix: LJ GRND WTR ColDate: 9/17/09 11:15 WET Weight Basis						Project: 421195-191 Locator: VAS_W-65 Descrip: VASHON ISLAND WELL Sample: L49077-5 Matrix: LJ GRND WTR ColDate: 9/17/09 12:15 WET Weight Basis						Project: 421195-191 Locator: VAS_W-70 Descrip: VASHON ISLAND, VAL Sample: L49077-6 Matrix: LJ GRND WTR ColDate: 9/17/09 13:30 WET Weight Basis					
Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units		
CV SM2320-B																	
Total Alkalinity	76.1		1	5	mg CaCO3/L	76.3		1	5	mg CaCO3/L	145		1	5	mg CaCO3/L		
CV SM2540-C																	
Total Dissolved Solids	159	H	5	20	mg/L	157	H	5	20	mg/L	232	H	5	20	mg/L		
CV SM2540-D																	
Total Suspended Solids	2.4		0.5	1	mg/L	1.6		0.5	1	mg/L	3.3		0.5	1.1	mg/L		
CV SM4110B CL																	
Chloride	7.23		0.05	0.1	mg/L	7.34		0.05	0.1	mg/L	11.5		0.1	0.2	mg/L		
CV SM4110B FL																	
Fluoride	0.04	<RDL	0.02	0.04	mg/L	0.0679		0.02	0.04	mg/L	0.195		0.02	0.04	mg/L		
CV SM4110B SO4																	
Sulfate	19		0.2	0.4	mg/L	16.4		0.1	0.2	mg/L	17		0.1	0.2	mg/L		
CV SM4500-N-C																	
Total Nitrogen	<MDL		0.05	0.1	mg/L	<MDL		0.05	0.1	mg/L	1.34		0.05	0.1	mg/L		
CV SM4500-NO3-F																	
Nitrite + Nitrate Nitrogen	<MDL		0.01	0.04	mg/L	<MDL		0.01	0.04	mg/L	<MDL		0.01	0.04	mg/L		
CV SM4500-P-B,F																	
Total Phosphorus	0.0528		0.005	0.01	mg/L	0.0536		0.005	0.01	mg/L	0.378		0.005	0.01	mg/L		
CV SM4500-P-F																	
Orthophosphate Phosphorus	0.0472		0.002	0.005	mg/L	0.0455		0.002	0.005	mg/L	0.325		0.01	0.025	mg/L		
CV WHITLEDGE 1981																	
Silica	43.2		0.05	0.1	mg/L	44.6		0.05	0.1	mg/L	31.8		0.05	0.1	mg/L		
ES NONE																	
Field Personnel	EWF/DR				none	EWF/DR				none	EWF/DR				none		
Sample Code	Grab				none	Grab				none	Grab				none		
MT EPA 200.8*SW846 6020A																	
Antimony, Total, ICP-MS	<MDL		0.3	1	ug/L	<MDL		0.3	1	ug/L	<MDL		0.3	1	ug/L		
Arsenic, Total, ICP-MS	1.4		0.1	0.5	ug/L	1.45		0.1	0.5	ug/L	11.7		0.1	0.5	ug/L		
Beryllium, Total, ICP-MS	<MDL		0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L		
Cadmium, Total, ICP-MS	<MDL		0.05	0.25	ug/L	<MDL		0.05	0.25	ug/L	<MDL		0.05	0.25	ug/L		
Calcium, Total, ICP-MS	15000		10	50	ug/L	14100		10	50	ug/L	9190		10	50	ug/L		
Chromium, Total, ICP-MS	0.37	<RDL	0.2	1	ug/L	0.27	<RDL	0.2	1	ug/L	0.8	<RDL	0.2	1	ug/L		
Copper, Total, ICP-MS	<MDL		0.4	2	ug/L	2	<RDL	0.4	2	ug/L	0.97	<RDL	0.4	2	ug/L		
Iron, Total, ICP-MS	97.9		10	50	ug/L	2050		10	50	ug/L	299		10	50	ug/L		
Lead, Total, ICP-MS	<MDL		0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L	0.18	<RDL	0.1	0.5	ug/L		
Magnesium, Total, ICP-MS	10500		10	50	ug/L	10100		10	50	ug/L	3320		10	50	ug/L		
Nickel, Total, ICP-MS	0.553		0.1	0.5	ug/L	0.4	<RDL	0.1	0.5	ug/L	0.944		0.1	0.5	ug/L		
Potassium, Total, ICP-MS	2060		100	500	ug/L	1960		100	500	ug/L	7450		100	500	ug/L		
Selenium, Total, ICP-MS	<MDL		0.5	2.5	ug/L	<MDL		0.5	2.5	ug/L	<MDL		0.5	2.5	ug/L		
Silver, Total, ICP-MS	<MDL		0.05	0.25	ug/L	<MDL		0.05	0.25	ug/L	<MDL		0.05	0.25	ug/L		
Sodium, Total, ICP-MS	5590		20	100	ug/L	5170		20	100	ug/L	52400		100	500	ug/L		
Thallium, Total, ICP-MS	<MDL		0.04	0.2	ug/L	<MDL		0.04	0.2	ug/L	<MDL		0.04	0.2	ug/L		
Zinc, Total, ICP-MS	1.2	<RDL	0.5	2.5	ug/L	1.8	<RDL	0.5	2.5	ug/L	1.5	<RDL	0.5	2.5	ug/L		
MT EPA 200.8/SW846 6020A*SM2340B																	
Hardness, Calc	80.7		0.066	0.331	mg CaCO3/L	76.8		0.066	0.331	mg CaCO3/L	36.6		0.066	0.331	mg CaCO3/L		
ES NONE																	
Sample Information																	

King County Environmental Lab Analytical Report

Project: 421195-191 Locator: VAS_W-71 Descrip: VASHON ISLAND, ISL Sample: L49077-7 Matrix: LJ GRND WTR ColDate: 9/21/09 14:10 WET Weight Basis						Project: 421195-191 Locator: VAS_W-72 Descrip: VASHON ISLAND, PAR Sample: L49077-8 Matrix: LJ GRND WTR ColDate: 9/22/09 9:20 WET Weight Basis						Project: 421195-191 Locator: VAS_W-73 Descrip: VASHON ISLAND, 11T Sample: L49077-9 Matrix: LJ GRND WTR ColDate: 9/22/09 11:30 WET Weight Basis					
Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units		
CV SM2320-B																	
Total Alkalinity	72.3		1	5	mg CaCO3/L	124		1	5	mg CaCO3/L	75.8		1	5	mg CaCO3/L		
CV SM2540-C																	
Total Dissolved Solids	140		5	20	mg/L	204		5	20	mg/L	156		5	20	mg/L		
CV SM2540-D																	
Total Suspended Solids	<MDL		1.4	2.9	mg/L	4.2		0.5	1	mg/L	6.2		0.5	1	mg/L		
CV SM4110B CL																	
Chloride	3.07		0.05	0.1	mg/L	13.1		0.1	0.2	mg/L	5.11		0.05	0.1	mg/L		
CV SM4110B FL																	
Fluoride	0.0469		0.02	0.04	mg/L	0.029	<RDL	0.02	0.04	mg/L	0.0658		0.02	0.04	mg/L		
CV SM4110B SO4																	
Sulfate	21.2		0.1	0.2	mg/L	11.4		0.1	0.2	mg/L	14.3		0.1	0.2	mg/L		
CV SM4500-N-C																	
Total Nitrogen	<MDL		0.05	0.1	mg/L	0.789		0.05	0.1	mg/L	<MDL		0.05	0.1	mg/L		
CV SM4500-NO3-F																	
Nitrite + Nitrate Nitrogen	<MDL		0.01	0.04	mg/L	0.784		0.01	0.04	mg/L	<MDL		0.01	0.04	mg/L		
CV SM4500-P-B,F																	
Total Phosphorus	0.0386		0.005	0.01	mg/L	0.035		0.005	0.01	mg/L	0.105		0.005	0.01	mg/L		
CV SM4500-P-F																	
Orthophosphate Phosphorus	0.0293		0.002	0.005	mg/L	0.0287		0.002	0.005	mg/L	0.0763		0.002	0.005	mg/L		
CV WHITLEDGE 1981																	
Silica	36.2		0.05	0.1	mg/L	40.3		0.05	0.1	mg/L	42.1		0.05	0.1	mg/L		
ES NONE																	
Field Personnel	EWf/DR				none	EWf/DR				none	EWf/DR				none		
Sample Code	Grab				none	Grab				none	Grab				none		
MT EPA 200.8*SW846 6020A																	
Antimony, Total, ICP-MS	<MDL		0.3	1	ug/L	<MDL		0.3	1	ug/L	<MDL		0.3	1	ug/L		
Arsenic, Total, ICP-MS	1.74		0.1	0.5	ug/L	1.35		0.1	0.5	ug/L	3.2		0.1	0.5	ug/L		
Beryllium, Total, ICP-MS	<MDL		0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L		
Cadmium, Total, ICP-MS	<MDL		0.05	0.25	ug/L	<MDL		0.05	0.25	ug/L	<MDL		0.05	0.25	ug/L		
Calcium, Total, ICP-MS	8880		10	50	ug/L	18600		10	50	ug/L	15300		10	50	ug/L		
Chromium, Total, ICP-MS	<MDL		0.2	1	ug/L	1.66		0.2	1	ug/L	0.53	<RDL	0.2	1	ug/L		
Copper, Total, ICP-MS	<MDL		0.4	2	ug/L	0.53	<RDL	0.4	2	ug/L	0.67	<RDL	0.4	2	ug/L		
Iron, Total, ICP-MS	1270		10	50	ug/L	127		10	50	ug/L	1190		10	50	ug/L		
Lead, Total, ICP-MS	<MDL		0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L		
Magnesium, Total, ICP-MS	13300		10	50	ug/L	18900		10	50	ug/L	9690		10	50	ug/L		
Nickel, Total, ICP-MS	0.739		0.1	0.5	ug/L	3.21		0.1	0.5	ug/L	1.42		0.1	0.5	ug/L		
Potassium, Total, ICP-MS	1550		100	500	ug/L	2150		100	500	ug/L	1850		100	500	ug/L		
Selenium, Total, ICP-MS	<MDL		0.5	2.5	ug/L	<MDL		0.5	2.5	ug/L	<MDL		0.5	2.5	ug/L		
Silver, Total, ICP-MS	<MDL		0.05	0.25	ug/L	<MDL		0.05	0.25	ug/L	<MDL		0.05	0.25	ug/L		
Sodium, Total, ICP-MS	5480		20	100	ug/L	7860		20	100	ug/L	5420		20	100	ug/L		
Thallium, Total, ICP-MS	<MDL		0.04	0.2	ug/L	<MDL		0.04	0.2	ug/L	<MDL		0.04	0.2	ug/L		
Zinc, Total, ICP-MS	2.5	<RDL	0.5	2.5	ug/L	1.1	<RDL	0.5	2.5	ug/L	0.61	<RDL	0.5	2.5	ug/L		
MT EPA 200.8/SW846 6020A*SM2340B																	
Hardness, Calc	76.9		0.066	0.331	mg CaCO3/L	124		0.066	0.331	mg CaCO3/L	78		0.066	0.331	mg CaCO3/L		
ES NONE																	
Sample Information																	

King County Environmental Lab Analytical Report

Project: 421195-191
 Locator: GROUNDNDUP
 Descrip: GROUNDWATER DUPLIC
 Sample: L49077-10
 Matrix: LJ GRND WTR
 ColDate: 9/17/09 13:35
WET Weight Basis

Project: 421195-191
 Locator: ATMOSBLANK
 Descrip: ATMOSPHERE BLANK
 Sample: L49077-11
 Matrix: LN BLANK WTR
 ColDate: 9/17/09 12:15
WET Weight Basis

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV SM2320-B										
Total Alkalinity	145		1	5	mg CaCO3/L					
CV SM2540-C										
Total Dissolved Solids	234	H	5	20	mg/L					
CV SM2540-D										
Total Suspended Solids	3.26		0.5	1.1	mg/L					
CV SM4110B CL										
Chloride	11.5		0.1	0.2	mg/L					
CV SM4110B FL										
Fluoride	0.198		0.02	0.04	mg/L					
CV SM4110B SO4										
Sulfate	16.7		0.1	0.2	mg/L					
CV SM4500-N-C										
Total Nitrogen	1.39		0.05	0.1	mg/L					
CV SM4500-NO3-F										
Nitrite + Nitrate Nitrogen	<MDL		0.01	0.04	mg/L					
CV SM4500-P-B,F										
Total Phosphorus	0.388		0.005	0.01	mg/L					
CV SM4500-P-F										
Orthophosphate Phosphorus	0.314		0.01	0.025	mg/L					
CV WHITLEDGE 1981										
Silica	31.5		0.05	0.1	mg/L					
ES NONE										
Field Personnel	EWf/DR				none	EWf/DR				none
Sample Code	Grab				none	Grab				none
MT EPA 200.8*SW846 6020A										
Antimony, Total, ICP-MS	<MDL		0.3	1	ug/L	<MDL		0.3	1	ug/L
Arsenic, Total, ICP-MS	11		0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L
Beryllium, Total, ICP-MS	<MDL		0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L
Cadmium, Total, ICP-MS	<MDL		0.05	0.25	ug/L	<MDL		0.05	0.25	ug/L
Calcium, Total, ICP-MS	9190		10	50	ug/L					
Chromium, Total, ICP-MS	0.61	<RDL	0.2	1	ug/L	<MDL		0.2	1	ug/L
Copper, Total, ICP-MS	0.71	<RDL	0.4	2	ug/L	<MDL		0.4	2	ug/L
Iron, Total, ICP-MS	218		10	50	ug/L					
Lead, Total, ICP-MS	0.12	<RDL	0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L
Magnesium, Total, ICP-MS	3350		10	50	ug/L					
Nickel, Total, ICP-MS	0.683		0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L
Potassium, Total, ICP-MS	7310		100	500	ug/L					
Selenium, Total, ICP-MS	<MDL		0.5	2.5	ug/L	<MDL		0.5	2.5	ug/L
Silver, Total, ICP-MS	<MDL		0.05	0.25	ug/L	<MDL		0.05	0.25	ug/L
Sodium, Total, ICP-MS	56100		100	500	ug/L					
Thallium, Total, ICP-MS	<MDL		0.04	0.2	ug/L	<MDL		0.04	0.2	ug/L
Zinc, Total, ICP-MS	1.1	<RDL	0.5	2.5	ug/L	<MDL		0.5	2.5	ug/L
MT EPA 200.8/SW846 6020A*SM2340B										
Hardness, Calc	36.7		0.066	0.331	mg CaCO3/L					
ES NONE										
Sample Information	FREP@L49077-6, W-70				none	ABlnk@L49077				none